HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Lewis River Spring Chinook (Segregated+Integrated)
Species or Hatchery Stock:	Chinook (*Oncorhynchus tshawytscha*) Lewis River Stock
Agency/Operator:	Washington Department of Fish and Wildlife/ PacifiCorp Energy
Watershed and Region:	Lewis River/ Lower Columbia River
Date Submitted:	
Date Last Updated:	July 15, 2014

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Executive Summary

The Washington Department of Fish and Wildlife is submitting a Hatchery and Genetic Management Plan (HGMP) for the Lewis River Spring Chinook program to the National Marine Fisheries (NMFS) for consultation under Section 10(a)(1)(A) of the Endangered Species Act (ESA). NMFS will use the information in this HGMP to evaluate the hatchery impacts on salmon and steelhead listed under the ESA. The primary goal of an HGMP is to devise biologically-based hatchery management strategies that ensure the conservation and recovery of salmon and steelhead populations. This HGMP focuses on the implementation of hatchery reform actions adopted by the Washington Fish and Wildlife Commission Policy on Hatchery and Fishery Reform C-3619 and implementation of PacifiCorp Energy's Federal Energy Regulatory Commission (FERC) Licenses.

The purpose of the program is to produce Lewis River Chinook for sustainable escapement to the watershed, while providing recreational fisheries. Program fish will be produced at Speelyai Hatchery, which is located on Speelyai Creek (WRIA 27.0431), tributary to the Lewis River (WRIA 27.0168) at RKm 46.7, and Lewis River Hatchery, located on the Lewis River at RKm 25.0. The program will annually release 1,250,000 yearlings to the lower Lewis River, as well as 15,000 sub-yearlings and 85,000 yearlings to the upper Lewis River and tributaries.

This spring Chinook HGMP is built around the principles and recommendations of the Hatchery Scientific Review Group (HSRG). These principles and recommendations represent the best science available for operating hatchery facilities consistent with the conservation of salmonid species. This facility has both "segregated-type" and "integrated type" programs, as defined by the HSRG. The program has operated since 1974; the integrated upper river supplementation program has operated since 2011. A "segregated" program is one in which only hatchery-origin individuals are used in the hatchery broodstocks. Segregation is achieved by using returning adult hatchery-origin spring Chinook (distinguished by an adipose fin clip or CWT-only) returning to the Lewis River. An "integrated" program is one in which natural-origin individuals are used in the hatchery broodstocks. Integration is achieved by using up to 30% of the returning adult natural-origin spring Chinook (distinguished by an intact adipose fin) returning to the Lewis River at the Merwin Dam Fish Collection Facility (FCF) (RKm 30.4) and the Lewis River Hatchery trap (RKm 25.0) from April through September. All fish released through the segregated hatchery program have been 100% mass-marked (adipose fin-clipped) since 2002 with the exception of 150,000 yearling spring Chinook are also released coded-wire tagged only (CWT). Also 150,000 are released as Adipose fin clipped and CWT tagged. All yearling smolts released from Muddy River and Clear Creek acclimation ponds (integrated program) are released unmarked and untagged with the exception or 10% being Passive Integrated Transponder tagged (PIT tagged only). 10% of the 15,000 sub-yearlings released in the Upper Lewis River are released with Passive Integrated Transponder (PIT) tags only.

The Lower Columbia River Chinook are listed as "Threatened" under the ESA. The DPS includes the Lewis River Chinook Program.

Broodstock Collection:
The broodstock for both segregated and integrated programs are derived from stock returning to the Lewis sub-basin. The proportion of natural-origin fish in the broodstock (pNOB) has averaged 50% over the last five years for the integrated program. The current egg-take goal at Speelyai Hatchery is 1,750,000 for the segregated program, and 125,000 for the integrated program; up to 690 and 65 adult pairs, respectively, may be collected. Surplus hatchery fish above broodstock needs may be used for adult supplementation in the Lewis watershed above Swift Reservoir, towards a minimum goal of 2,000 adults. Carcasses from adults collected and/or used for broodstock are disposed of in a landfill.

Harvest:
Total annual harvest is dependent on management response to annual abundance in *Pacific Salmon Commission* (PSC - U.S./Canada), *Pacific Fishery Management Council* (PFMC - U.S. ocean), and

Columbia River Compact forums. WDFW has also received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the *Fisheries Management and Evaluation Plan* (FMEP), *Columbia River Fish Management Plan* (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia River Spring Chinook population. The *U.S. v Oregon* Technical Advisory Committee (TAC) has prepared Biological Assessments (BAs) for combined fisheries based on relevant *U.S. v Oregon* management plans and agreements. The current BA concerns Columbia River treaty Indian and non-Indian fisheries, as described in the "2008–2017 *U.S. v Oregon* Management Agreement for upriver Chinook, sockeye, steelhead, coho, and white sturgeon" (2008–2017 MA).

Under permanent regulations, the mainstem Columbia River from Buoy 10 to the I-5 Bridge (RM 106) is open for spring Chinook angling during January 1 through March 31, and the area from the I-5 Bridge upstream to the Oregon/Washington border (upstream of McNary Dam) has been closed beginning January 1 each year since 1993. Mark-selective recreational fisheries for spring Chinook have occurred annually since 2001. These fisheries were generally characterized by high effort and catch rates, as well as excellent compliance among anglers with the mark-selective fishing regulations.

Based on the average smolt-to-adult survival rate of 0.30% for 2000-2009 brood years (RMIS 2014), and a programmed release goal of 1,250,000 yearlings, the estimated adult production (goal) level would be 3,750.

Monitoring and Evaluation:
The Lewis River Settlement Agreement (SA 2004) outlines monitoring requirements for the Lewis River Hatchery programs developed as part of the new license that PacifiCorp and Cowlitz PUD received from FERC. A Monitoring and Evaluation (M&E 2010) Plan, a Hatchery and Supplementation (H&S 2009) Plan and associated Annual Operating Plans (AOP) have been developed to address the monitoring requirements of the Settlement Agreement (SA 2004, H&S 2009, M&E 2010).

Performance indicators for harvest will be accomplished by continuing mass-marking (adipose fin-clip); CWT recoveries help determine stray rate contributions on spawning grounds by watersheds close in proximity to this program's release vicinity.

Operation and Maintenance of Hatchery Facilities:
The Lewis River Spring Chinook program uses several facilities. Speelyai Hatchery has water rights to divert water at a rate of 30 cfs from Speelyai Creek. Lewis River Hatchery has water rights totaling 38,613 gpm from the Lewis River. The return water systems operate under a National Pollutant Discharge Elimination System (NPDES) permit. Fish reared at Muddy River and Clear Creek acclimation ponds are <20,000 lbs and <5,000 lbs of fish feed per month, and therefore, do not require and NPDES permit.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Lewis River Spring Chinook.

1.2 Species and population (or stock) under propagation, and ESA status.

Lewis River spring Chinook (*Oncorhynchus tshawytscha*)

ESA Status: "Threatened" March 24, 1999 (64FR14308); reaffirmed on August 15, 2011 (76 FR 50448).

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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Fish Management Staff Lead Contact

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

PacifiCorp Energy and Cowlitz PUD: FERC license operators for Lewis River Hydroelectric Projects.

PacifiCorp Energy Staff Lead Contact

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1.4 Funding source, staffing level, and annual hatchery program operational costs.

Funding Sources	Operation Information
PacifiCorp	Full time equivalent staff – 5.6
Cowlitz PUD	Annual operating cost (dollars) -1,392,185

The above information for full-time equivalent staff and annual operating cost applies cumulatively to anadromous program facilities (Lewis River and Speelyai hatcheries) and cannot be broken out specifically by program.

PacifiCorp Energy and the Cowlitz County Public Utility District (PUD) No. 1 presently funds production of mitigation fish released in the Lewis River system, including spring Chinook, kokanee, rainbow trout, coho and steelhead.

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Lewis River spring Chinook

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Merwin Dam Fish Collection Facility (FCF)	Broodstock collection	Located at RKm 30.42 on the Lewis River (WRIA 27.0168), Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Lewis River Hatchery	Broodstock collection, rearing, acclimation	Located at RKm 24.95 on the Lewis River (WRIA 27.0168), Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Speelyai Hatchery	Broodstock collection, adult holding/spawning, incubation, rearing, acclimation	Located at RKm 1.61 on Speelyai Creek (WRIA 27.0431); tributary to the Lewis River (WRIA 27.0168) at RKm 46.67, Lewis sub-basin; tributary to the Columbia River at RKm 140, Lower Columbia River Washington.
Muddy River Acclimation Pond	Rearing, acclimation	Located at RKm 8.04 on Muddy River (WRIA 27.0517); tributary to Lewis River (WRIA 27.0168) at RKm 96.7 (RM 60.1).
Clear Creek Acclimation Pond	Rearing, acclimation	Located at RKm 2.41 on Clear Creek (WRIA 27.0519); tributary to Muddy River (WRIA 27.0517) at RKm 7.6 (RM 4.7); tributary to Lewis River (WRIA 27.0168) at RKm 96.7 (RM 60.1).

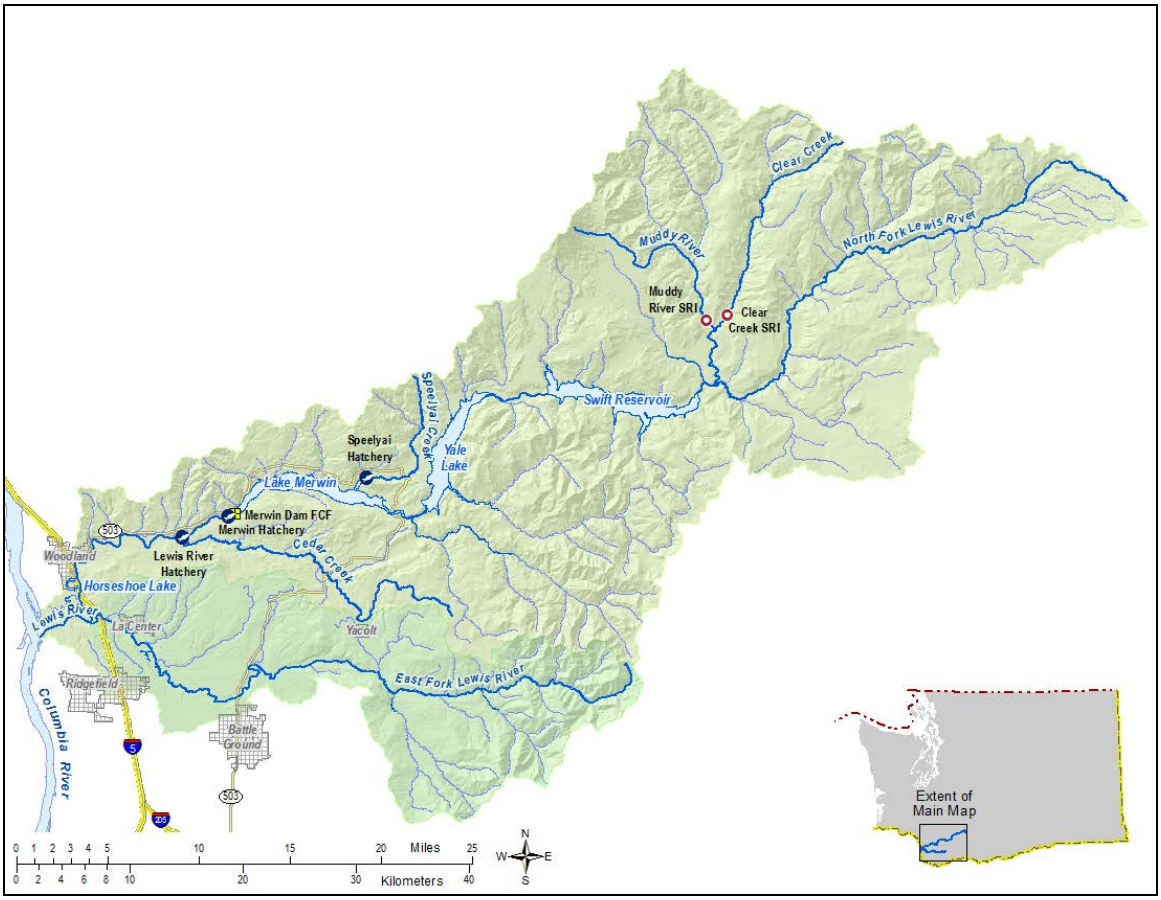

Figure 1.1: Lewis Hatchery Complex and associated acclimation and release sites. Source: WDFW GIS 2014.

1.6 Type of program.

Segregated Harvest.

Integrated Recovery (Upper Lewis Supplementation).

1.7 Purpose (Goal) of program.

Mitigation/Augmentation and Conservation. The goal of this program is to support fisheries in the basin and lower Columbia River, while eliminating a directed harvest on wild fish, and also provide adult ocean-recruits for supplementation and reintroduction efforts in the Upper North Fork Lewis River sub-basin. *Lewis River Hatchery and Supplementation Plan* (H&S 2006). Also serves as mitigation for development (including hydro-power) and habitat degradation.

1.8 Justification for the program.

The program is funded through PacifiCorp and the Cowlitz County PUD for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River- *Fish Management and Evaluation Plan* (FMEP) (WDFW 2001) and the *Lewis River Hatchery and Supplementation Plan* (H&S 2006).

Catches of hatchery fish sustain the economies of local communities while keeping incidental mortalities of ESA-Listed fish at approved levels. Value of hatchery production and benefit to local economies will be further increased by implementing fisheries that increase harvest of hatchery produced fish, as expected through implementation of the *Lower Columbia Salmon Recovery Plan* LCSRP.

To minimize impact on listed fish by the Lewis River program and operations, the following risk aversions are included in this HGMP (**Table 1.8.1**).

Table 1.8.1: Summary of risk aversion measures for the Lewis River Spring Chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Water rights are formalized through trust water right from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.1	The upper intake and screens are in compliance with state and federal guidelines (NOAA-NMFS 1995, 1996), and meet the current *Anadromous Salmonid Passage Facility Design* criteria (NOAA-NMFS 2011). The lower intake is scheduled to be remodeled in 2015 to meet standards.
Effluent Discharge	4.1	The Lewis Hatchery Complex operates under the "U*pland Fin-Fish Hatching and Rearing*" *National Pollution Discharge Elimination System* (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-1040. Upper Lewis Supplementation releases occur in short-term rearing and off channel acclimation ponds; feeding and production stays under NPDES guidelines for permitting. The facilities meet guidelines which do not require the NPDES general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month).
Broodstock Collection & Adult Passage	7.9	All fish are mass marked (adipose fin clipped) prior to release. Broodstock collection and sorting procedures can quickly identify non-target listed fish (assumed if adipose fin is

		intact), and if encountered, released per protocol to minimize impact as determined by WDFW Region 5 staff.
Disease Transmission	7.9, 10.11	The *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and the *Fish Health Policy in the Columbia Basin* details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size and the system and life history stage to foster rapid migration to marine waters, and to allow juvenile listed fish to grow to a size that reduces potential for predation. Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See HGMP section 1.10. Standards and indicators are referenced from Northwest Power Planning Council (NPPC) Artificial Production Review (APR) (NPPC 2001).

1.10 List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1 <u>"Performance Indicators" addressing benefits.</u>

Table 1.10.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.2 Program contributes to mitigation requirements. Program provides mitigation for lost fish production due to development within the Columbia River Basin.	Number of fish released by program returning, or caught, as applicable to given mitigation requirements.	Annually estimate survival and contribution for each brood year released. This program provides mitigation for lost fish production due to development within the Lewis River Basin and contributes to a meaningful harvest in sport and commercial fisheries.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	Hatchery program operation addresses ESA requirements through the development and review of this HGMP. HGMP updated and re-submitted to NOAA with significant changes or under permit agreement. Compliance with ESA is managed with sport fishery regulations that minimize impacts to ESA-listed fish and are monitored by WDFW law enforcement officers. The FMEP outlines anticipated encounter rates and expected mortality rates

		for these fisheries. Natural populations are monitored annually to assess trends and compare with goals.
3.2.1: Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities.	A quality control check is done prior to release to estimate the error rate of mass marking. The external mark enables mark-selective fisheries, which can reduce directed harvest mortality on natural-origin fish. Harvest is regulated to meet appropriate biological assessment criteria. Agencies monitor harvests to provide up-to-date information. Estimate survival and contribution to fisheries for each brood year released.
3.3.1. Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.	An annual number of naturally-produced adults or redds on the spawning grounds or selected natural production index areas is estimated.	The returns to the hatchery and spawning grounds are monitored and reported annually.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (fin-clip, CWT, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish.	Annually monitor and report size, number, mass-mark quality (mark rate/tag rate) and date of all hatchery releases. Annually sample returning fish for the mass-mark and CWT in fisheries and at the hatchery; monitor and report numbers of estimated hatchery (marked) and natural (unmarked) fish. Report CWT analysis to RMIS database. The DIT group (CWT-only) was introduced to provide indicators for natural production in order to evaluate differential effects of mark-selective fisheries, catch contributions, run timing, total survival, migration patterns and straying into other watersheds. Upper Lewis supplementation sub-yearlings are released, a portion are PIT tag-only (see HGMP section 10.7).
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of	Temporal distribution of broodstock collection at point of collection.	Collect broodstock representatively and systematically throughout the early portion of the return (April through September).

population from which broodstock is taken.		Collect annual run timing, age and sex composition and spawning escapement timing data. Adhere to WDFW spawning guidelines (Seidel 1983; HSRG 2009).
3.5.5 Juveniles are released at fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Level of smoltification (size, appearance, behavior, etc.) at release compared to WDFW rearing and release guidelines. Release type (forced, volitional, or direct).	Monitor fish condition in the facilities throughout all rearing stages. Annually monitor and record size, number, and date of release.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Apply basic monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Collect annual run timing, age and sex composition data upon adult return. Annually record growth rates, mark rate and size at release and release dates. See also HGMP section 11 for program monitoring and evaluation.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Program is designed to help achieve the end goal of conserving and stabilizing natural salmon populations.	Long-term monitoring of system population will indicate success of program.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2: **"Performance indicators" addressing risks.**

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Program risks have been addressed in this HGMP through best available science hatchery management actions. WDFW staff annually reviews Future Brood Document (FBD) for stock, size, number, date and location of releases from all production programs. Monitor and record juvenile hatchery fish size, number, date of release and mass-mark quality; monitor contribution of hatchery adult fish to fisheries and escapement.
3.2.1 Fish produced for harvest are produced and released in a	The number of marks released and the proportion of marks in	Monitor and record juvenile hatchery fish size, number, date

manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	out-migrant juveniles and returning adults on the spawning ground are estimated annually. Production fish are mass-marked (adipose fin-clip) to allow for their differentiation from naturally-produced fish.	of release and mass-mark (fin clips, tags, etc.) quality; monitor contribution of hatchery adult fish to fisheries and escapement. Harvest is regulated to meet appropriate biological assessment criteria. Spring Chinook fisheries in the Lewis River are mark selective, and require the release of all wild Spring Chinook. Agencies monitor harvests and hatchery escapements to provide up-to-date information.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, etc., depending on species) produced fish to allow for their differentiation from naturally produced fish for selective fisheries.	Annually monitor and report mass-mark type, quality and rates. Annually assess harvest of mass-marked hatchery fish based on CRC estimates and creel surveys. DIT groups (CWT-only) can provide data on catch contributions, run timing, total survival, migration patterns, straying, in-stream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production and to evaluate effects of the program on the local natural population.	All hatchery production is identifiable in some manner (fin-marks, tags, otolith, etc.) consistent with information needs.	Annually monitor and report mass-mark type, quality and rates. Examine returning fish encountered for the mass-mark (CWT) at the hatchery and on the spawning ground. Annually record numbers of estimated hatchery (marked) and natural (unmarked). The DIT group (CWT-only) provides indicators for natural production in order to evaluate differential effects of mark-selective fisheries, catch contributions, run timing, total survival, migration patterns and straying into other watersheds.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at collection point.	Collect annual run timing, age and sex composition and return timing data.
3.5.1 Patterns of genetic	Within and between populations,	See HGMP section 11 for M&E

variation within and among natural populations do not change significantly as a result of artificial production.	genetic structure is not affected by artificial production.	information.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Total number of natural-origin spawners (if any) reaching the collection facility. Timing of collection compared to overall run timing.	All on-station hatchery releases are identifiable in some manner (fin-marks, tags, etc.). Collect annual run timing, origin, and age and sex composition data. CWT data reported to RMIS. Examine returning fish for the mass-mark (fin-clips, CWTs) at broodstock collection points and on the spawning grounds. Annually record and report numbers of estimated hatchery (marked) and natural (unmarked).
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release).	Annually record and report release information, including location, method and age class in hatchery data systems (WDFW Hatcheries Headquarters Database).
3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct).	Annually monitor and record size, number, date of release and release type.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), *Fish Health Policy in the Columbia Basin*, and *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDFW water right permit compliance.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-	Water withdrawals compared to	Barrier and intake structure

stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	compliance assessed and needed fixes are prioritized.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, revised 2006).	Necropsies of fish to assess health, nutritional status, and culture conditions.	DFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	Examine fish 1 to 6 weeks prior to transfer or release, in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below broodstock collection site is currently compared to historic distribution.	Trap is checked regularly. Non-target and/or ESA listed fish, when encountered, are returned to the river.
3.7.7 Weir/trapping operations do not result in significant stress, injury or mortality in natural populations.	Mortality rates in trap. Pre-spawning mortality rates of captured fish in the hatchery and/or after release.	Traps checked regularly. Annually record and report abundances and observations of natural- origin fish at hatchery facilities.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally-origin salmon and steelhead (Sharpe et al. 2008).
3.8.2. Juvenile production costs	Total cost of program operation.	Annually monitor and report

are comparable to or less than other regional programs designed for similar objectives.		feed costs and fish health actions.

1.11 Expected size of program.

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish).

The *Lewis River Hatchery and Supplementation Plan* (H&S 2006) set the spring Chinook broodstock target for upper river supplementation at 65adults, with a target smolt release of 100,000. Around 690 adult pairs are needed to achieve the established egg-take goal of 1,750,000 for the segregated program (FBD 2014), based on an average fecundity of around 3,200 eggs/female and a pre-spawning mortality of 10%.

In addition, in the event that Cowlitz Salmon Hatchery is unable to meet egg-take goals for the Cathlamet Channel Net Pen program, up to 300,000 additional green eggs from Lewis River stock spring Chinook may be used as backfill. An additional 118 adults pairs would be needed to achieve this egg-take goal.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location.

Table 1.11.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Max. No.	Location	Major Watershed
Yearlings (segregated)	1,250,000	Lewis River	Lewis
Yearlings (integrated)	85,000	Upper Lewis River tributaries	
Sub-yearlings (integrated)	15,000	Upper Lewis River	

Source: Future Brood Document 2014.

1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Based on the average smolt-to-adult survival rate of 0.30% for 2000-2009 brood years (RMIS 2014), and a programmed release goal of 1,250,000 yearlings, the estimated adult production (goal) level would be 3,750 (see also **Tables 3.3.1.1**).

The *Lewis River Hatchery and Supplementation Plan* (H&S 2006) set the spring Chinook reintroduction threshold level at 2,000 adults. The Settlement Agreement sets the "hatchery target floor" level for upper river supplementation at 100,000 juveniles.

Table 1.12.1: Hatchery Escapement of Lewis River Spring Chinook for return years 2002 to 2013.

Return Year	Hatchery Escapement
2002	1,869
2003	3,037
2004	2,053
2005	4,134
2006	3,939
2007	1,178
2008	2,245
2009	1,384

2010	711
2011	1,214
2012	1,482
2013	1,908
Average	**2,096**

Source: Hatcheries Headquarters Database 2014.

1.13 Date program started (years in operation), or is expected to start.

The Lewis River Hatchery began operations in 1932. Speelyai Hatchery began operations in 1958. The Lewis River Spring Chinook Program was initiated in 1974; upper river smolt supplementation was initiated with the 2011 brood.

1.14 Expected duration of program.

On-going. Lewis River H&S Plan calls for the supplementation program to continue for a minimum of 15 years from its inception.

1.15 Watersheds targeted by program.

Lewis River (WRIA 27.0168), Lewis Sub-Basin, Lower Columbia River.

1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues.

Spring Chinook are collected at Lewis River Hatchery and the Merwin Dam Fish Collection Facility (FCF). Broodstock are held at Speelyai Hatchery until ripe, then spawned, incubated, reared, and released from Lewis Hatchery Complex facilities.

Both adult and juvenile supplementation strategies are employed to reintroduce spring Chinook to the Upper Lewis River basin. The Upper Lewis Basin supplementation fish (integrated program) are transported, acclimated, and released from Lewis River sites located above Swift Reservoir. Surplus hatchery adult spring Chinook are annually released upstream of Swift Reservoir. After adults begin returning from the natural or supplemented releases, hatchery-origin fish would only be used in the event that the number of fish produced above Swift are insufficient to meet the desired release numbers (H&S 2006).

The Lewis River Hatchery was renovated in 2009/2011 (see HGMP section 5). Above-ground valve access, individual float alarms, electrical outlets, lighting, walkways and handrail were also included in the remodel. The remodel the antiquated ponds has increased the rearing capacity and the quality of flow dynamics. In addition, these new changes are expected to lead to a better quality product with fewer disease problems and healthier smolts.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: *Discontinue the program*: This action would reduce potential interaction with natural populations and eliminate potential impacts on other ESA-listed species. Currently this program supports popular sport fisheries in the Lower Columbia River, and is consistent with the mitigation requirements and reintroduction.

Alternative 2: Use a smaller program size to meet both harvest and reintroduction goals for the watershed. The adult escapement to the hatchery has averaged under 1,800 adults (see HGMP section 1.12), which is below the minimum of 2,000 adults needed for escapement to the upper basin and the 1,000 needed as broodstock to continue the harvest program, as outlined in H&S 2006.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: Expand Lewis River monitoring. There is a need to expand the monitoring of spring Chinook in the Lewis River to identify a strategy that would reduce predation on wild Chinook and other ESA-listed species.

2 SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

2.1 List all ESA permits or authorizations in hand for the hatchery program.

None currently. This HGMP is submitted to the NOAA Fisheries for ESA consultation and take prohibition exemption under ESA section 4(d), 7, or 10.

2.2 Provide descriptions, status, and projected take actions and levels for NMFS ESA-listed natural populations in the target area.

2.2.1 Description of NMFS ESA-listed salmonid population(s) affected by the program.

- Identify the NMFS ESA-listed population(s) that will be directly affected by the program.

Lower Columbia River Chinook (*Oncorhynchus tshawytscha*). Listed as "threatened" on March 24, 1999 (64FR14308); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia River coho (*Oncorhynchus kisutch*). Identified as a candidate species on June 25, 1995 (60FR38011). Listed as threatened on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Lower Columbia River steelhead (*Oncorhynchus mykiss*). Listed as a threatened species on March 19, 1998 (63FR13347); threatened status reaffirmed on January 5, 2006 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

Columbia River chum salmon (*Oncorhynchus keta*). Listed as threatened on March 25, 1999 (64FR14507); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448).

2.2.2 Status of NMFS ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.

Lower Columbia River Chinook: In Washington, the LCR Chinook ESU includes all naturally spawned Chinook populations from the mouth of the Columbia to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, as well as seventeen artificial propagation programs (NMFS 2005 -70FR37160).

Status: Of the 32 historical populations in the ESU, 28 are considered extirpated or at very high risk (Ford 2011). Dam construction eliminated habitat for a number of populations leading to the extirpation of spring Chinook salmon populations in the Upper Cowlitz, Cispus, Tilton, North Fork Lewis , Big White Salmon rivers, and fall Chinook populations in the Upper Cowlitz and Big White Salmon rivers (SHIEER, NMFS 2004). Projects to allow access have been initiated in the Cowlitz and Lewis systems but these are not close to producing self-sustaining populations;

Condit Dam on the Big White Salmon River was breached October 26, 2011. Based on the recovery plan analyses, all of the 14 Tule populations (**Table 2.2.1**) are considered very high risk except one that is considered at high risk. The modeling conducted in association with Tule harvest management suggests that three of the populations (Coweeman, Lewis and Washougal) are at a somewhat lower risk. The Lewis River late-fall population is considered low or very low risk (Ford 2011).

Table 2.2.1: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River Chinook populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Fall										
Grays/Chinook	Contributing[2]	VL	H	VL	VL[2]	M+	+500%	800	<50	1,000
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	+150%	3,000	<50	1,500
Mill/Aber/Germ	Primary[1]	VL	H	L	VL[2]	H	+155%	2,500	50	900
Youngs Bay (OR)	Stabilizing	--[3]	--[3]	--[3]	L	L	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Contributing[1]	--[3]	--[3]	--[3]	VL	L	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	L	H	--[3]	--[3]	--[3]	--[3]
Cascade Fall										
Lower Cowlitz [C]	Contributing	VL	H	M	VL[2]	M+	+50%	24,000	500	3,000
Upper Cowlitz	Stabilizing	VL	VL	M	VL	VL	--	28,000	0	--
Toutle[C]	Primary[1]	VL	H	M	VL[2]	H+	+265%	11,000	<50	4,000
Coweeman [G]	Primary	VL	H	H	VL[2]	H+	+80%	3,500	100	900
Kalama	Contributing[2]	VL	H	M	VL[2]	M	+110%	2,700	<50	500
Lewis [G]	Primary	VL	H	H	VL[2]	H+	+280%	2,600	<50	1,500
Salmon	Stabilizing	VL	H	M	VL	VL	--	n/a	<50	--
Washougal	Primary	VL	H	M	VL[2]	H+	+190%	2,600	<50	1,200
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Contributing[1]	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Cascade L Fall										
Lewis NF [C,G]	Primary	VH	H	H	VH[1]	VH	0%	23,000	7,300	7,300
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Cascade Spring										
Upper Cowlitz [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	22,000	300	1,800
Cispus [C,G]	Primary	VL	L	M	VL[2]	H+	>500%	7,800	150	1,800
Tilton	Stabilizing	VL	VL	VL	VL	VL	0%	5,400	<100	--
Toutle	Contributing	VL	H	L	VL	M	>500%	3,100	100	1,100
Kalama	Contributing[2]	VL	H	L	VL	L	>500%	4,900	100	300
Lewis NF [C]	Primary	VL	L	M	VL	H	>500%	15,700	300	1,500
Sandy (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Fall										
L. Gorge (WA/OR)	Contributing	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
U. Gorge (WA/OR) [C]	Contributing[1]	VL	M	L	VL[2]	M	>500%	n/a	<50	1,200
White Salmon [C]	Contributing	VL	L	L	VL	M	>500%	n/a	<50	500
Hood (OR)	Primary[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge Spring										
White Salmon [C]	Contributing	VL	VL	VL	VL	L+	>500%	n/a	<50	500
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	VH	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

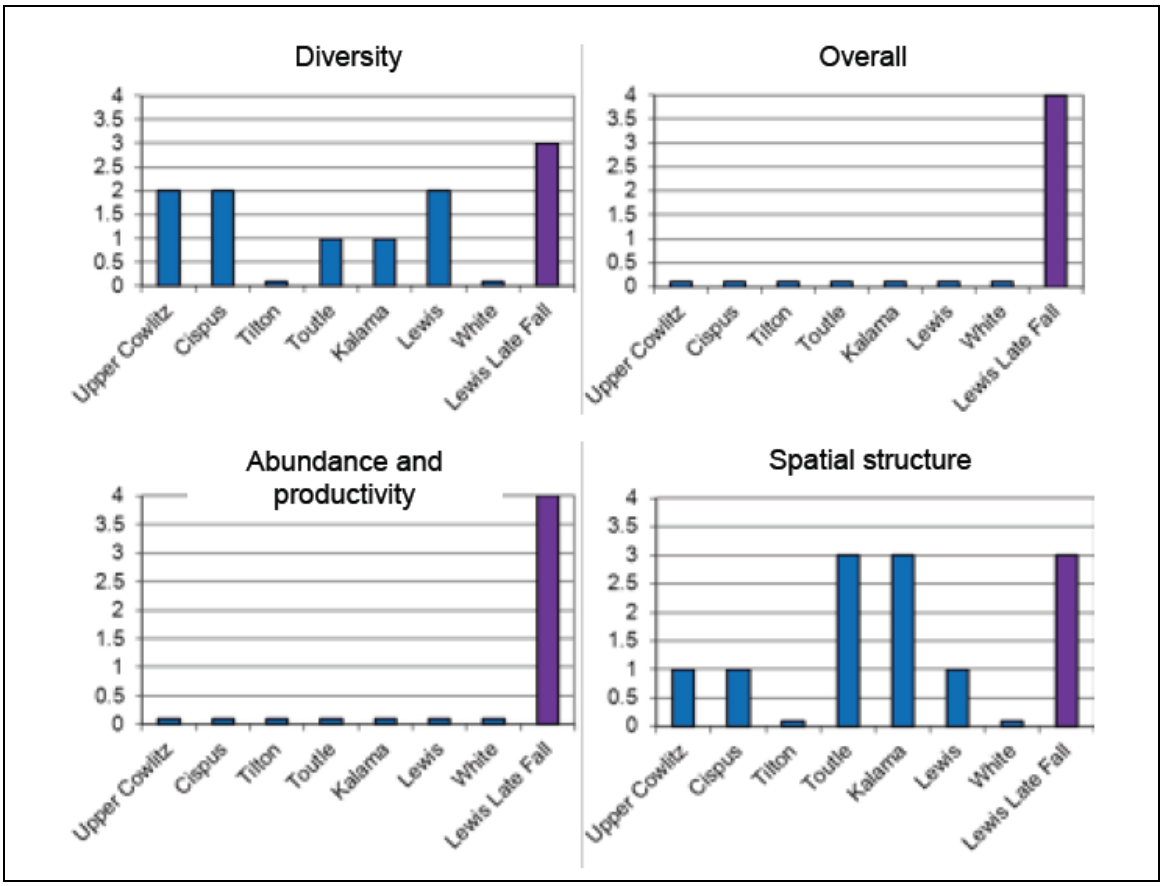

Figure 2.1: Current status of Washington lower Columbia River spring Chinook and late fall-run (bright) Chinook salmon populations for the VSP parameters and overall population risk. (LCFRB Recovery Plan 2010, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River Steelhead *(Oncorhynchus mykiss*): The DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as ten artificial propagation programs: the Cowlitz Trout Hatchery (in the Cispus, Upper Cowlitz, Lower Cowlitz, and Tilton Rivers), Kalama River Wild (winter- and summer-run) and Lewis River Wild Winter.

Status: Of the 26 historical populations in the ESU, 17 are considered at high or very high risk. Populations in the upper Lewis and Cowlitz watersheds remain cut-off from access to essential spawning habitat by hydroelectric dams. Projects to allow access have been initiated in the Cowlitz and Lewis systems but these have not yet produced self-sustaining populations (Ford 2011). Condit Dam on the White Salmon River was breached October 26, 2011. WDFW is currently developing watershed-specific management plans in accordance with the SSMP. As part of this planning process, WDFW is proposing to complete a thorough review of current steelhead stock status using the most up to date estimates of adult abundance, juvenile production and genetic information.

Table 2.2.2: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River steelhead populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast Winter										
Grays/Chinook	Primary	VH	VH	M	M[1]	H	0%[4]	1,600	800	800
Eloch/Skam	Contributing	VH	VH	M	M[1]	M+	0%[4]	1,100	600	600
Mill/Ab/Germ	Primary	H	VH	M	M[1]	H	0%[4]	900	500	500
Youngs Bay (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Big Creek (OR)	Primary	--[3]	--[3]	--[3]	H	VH	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary	--[3]	--[3]	--[3]	VH	VH	--[3]	--[3]	--[3]	--[3]
Cascade Winter										
Lower Cowlitz	Contributing	L	M	M	L	M	+5%	1,400	350	400
Upper Cowlitz [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,400	<50	500
Cispus [C,G]	Primary	VL	M	M	VL[2]	H[1]	>500%	1,500	<50	500
Tilton	Contributing	VL	M	M	VL	L	>500%	1,700	<50	200
S.F. Toutle	Primary	M	VH	H	M	H+	+35%	3,600	350	600
N.F. Toutle [C]	Primary	VL	H	H	VL[2]	H	+125%		120	600
Coweeman	Primary	L	VH	VH	L[2]	H	+25%	900	350	500
Kalama	Primary	L	VH	H	L[2]	H+	+45%	800	300	600
N.F. Lewis [C]	Contributing	VL	M	M	VL[2]	M	>500%	8,300	150	400
E.F. Lewis	Primary	M	VH	M	M[1]	H	+25%	900	350	500
Salmon	Stabilizing	VL	H	M	VL[2]	VL	0%	na	<50	--
Washougal	Contributing	L	VH	M	L[2]	M	+15%	800	300	350
Clackamas (OR) [C]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [C]	Primary	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Cascade Summer										
Kalama [C]	Primary	H	VH	M	M[1]	H	0%[4]	1,000	500	500
N.F. Lewis	Stabilizing	VL	VL	VL	VL	VL	0%	na	150	--
E.F. Lewis [G]	Primary	VL	VH	M	VL[2]	H	>500%	600	<50	500
Washougal [C,G]	Primary	M	VH	M	M[1]	H	+40%	2,200	400	500
Gorge Winter										
L. Gorge (WA/OR)	Primary	L	VH	M	L[2]	H	+45%	na	200	300
U. Gorge (WA/OR)	Stabilizing	L	M	M	L[2]	L	0%	na	200	--
Hood (OR) [C,G]	Primary	--[3]	--[3]	--[3]	M	H	--[3]	--[3]	--[3]	--[3]
Gorge Summer										
Wind [C]	Primary	VH	VH	H	H[1]	VH	0%[4]	na	1,000	1,000
Hood (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

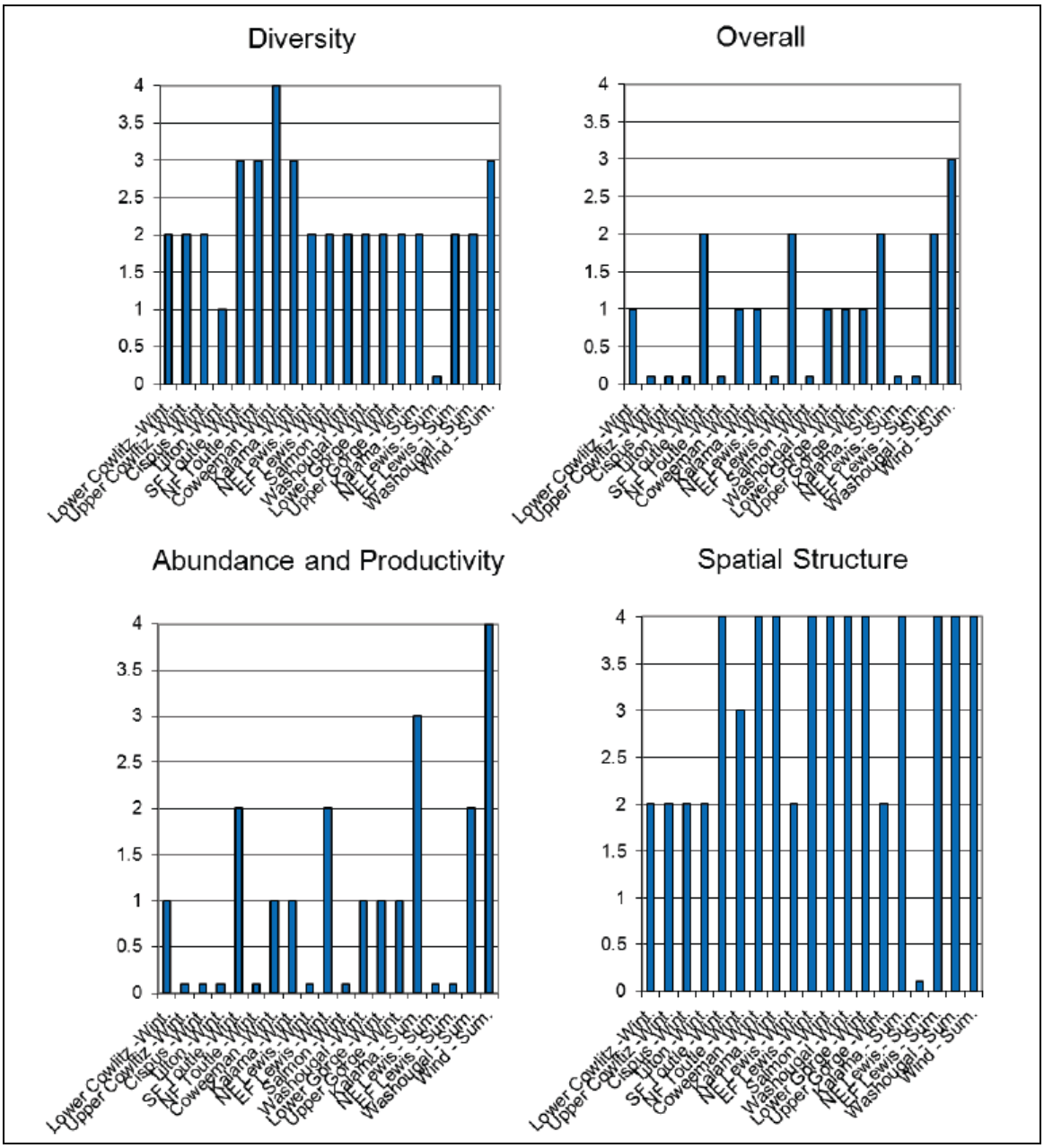

Figure 2.2: Current status of Washington LCR steelhead populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lower Columbia River coho *(Oncorhynchus kisutch)*: Originally part of a larger Lower Columbia River/Southwest Washington ESU, Lower Columbia coho were identified as a separate ESU and listed as threatened on June 28, 2005. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, The twenty-five artificial propagation programs include: the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program,

Washougal Hatchery Type-N Coho Program, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program.

Status: Three status evaluations of LCR coho status, all based on WLC-TRT criteria, have been conducted since the last BRT status update in 2005 (McElhany et al. 2007, Beamesderfer et al. 2010, LCFRB 2010). All three evaluations concluded that the ESU is currently at very high risk of extinction. All of the Washington side populations are considered at very high risk, although uncertainty is high because of a lack of adult spawner surveys. The 2005 BRT evaluation noted that smolt traps indicate some natural production in Washington populations, though given the high fraction of hatchery-origin spawners suspected to occur in these populations it is not clear that any are self-sustaining (Ford 2011). Since this time WDFW has implemented an ESU wide monitoring program for LCR coho which began in 2010. Preliminary results indicate that natural-origin population abundance may be higher than previously thought for certain populations (WDFW, unpublished). Results from the first 3 years of monitoring should be available in the near future.

Table 2.2.3: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River coho populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [L]	Primary	VL	H	VL	VL[2]	H	+370%	3,800	<50	2,400
Eloch/Skam [L]	Primary	VL	H	VL	VL[2]	H	+170%	6,500	<50	2,400
Mill/Ab/Germ [L]	Contributing	VL	H	L	VL[2]	M	>500%	2,800	<50	1,800
Youngs (OR) [L]	Stabilizing	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [L]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR) [L]	Primary[1]	--[3]	--[3]	--[3]	L	VH	--[3]	--[3]	--[3]	--[3]
Scappoose (OR) [L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Cascade										
Lower Cowlitz [L]	Primary	VL	M	M	VL[2]	H	+100%	18,000	500	3,700
Upper Cowlitz [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	18,000	<50	2,000
Cispus [E, L]	Primary[1]	VL	M	L	VL	H[1]	>500%	8,000	<50	2,000
Tilton [E, L]	Stabilizing[2]	VL	M	L	VL	VL[2]	0%	5,600	<50	--
Toutle SF [E, L]	Primary	VL	H	M	VL[2]	H	+180%	27,000	<50	1,900
Toutle NF [E, L]	Primary	VL	M	L	VL[2]	H	+180%		<50	1,900
Coweeman [L]	Primary	VL	H	M	VL[2]	H	+170%	5,000	<50	1,200
Kalama [L]	Contributing	VL	H	L	VL[2]	L	>500%	800	<50	500
NF Lewis [E, L]	Contributing	VL	L	L	VL[2]	L	+50%	40,000	200	500
EF Lewis [E, L]	Primary	VL	H	M	VL[2]	H	>500%	3,000	<50	2,000
Salmon [L]	Stabilizing	VL	M	VL	VL	VL	0%	na	<50	--
Washougal [L]	Contributing	VL	H	L	VL[2]	M+	>500%	3,000	<50	1,500
Clackamas (OR) [E, L]	Primary	--[3]	--[3]	--[3]	M	VH	--[3]	--[3]	--[3]	--[3]
Sandy (OR) [E, L]	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L Gorge (WA/OR) [L]	Primary	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge (WA) [L]	Primary[1]	VL	M	VL	VL[2]	H	+400%	na	<50	1,900
U Gorge/Hood (OR)[E]	Contributing[4]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[1] Increase relative to interim Plan.
[2] Reduction relative to interim Plan.
[3] Addressed in Oregon Management Unit plan.
[4] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[E] Early run (Type S) coho stock.
[L] Late run (Type N) coho stock.
(Core and Legacy populations not designated by the TRT for coho).

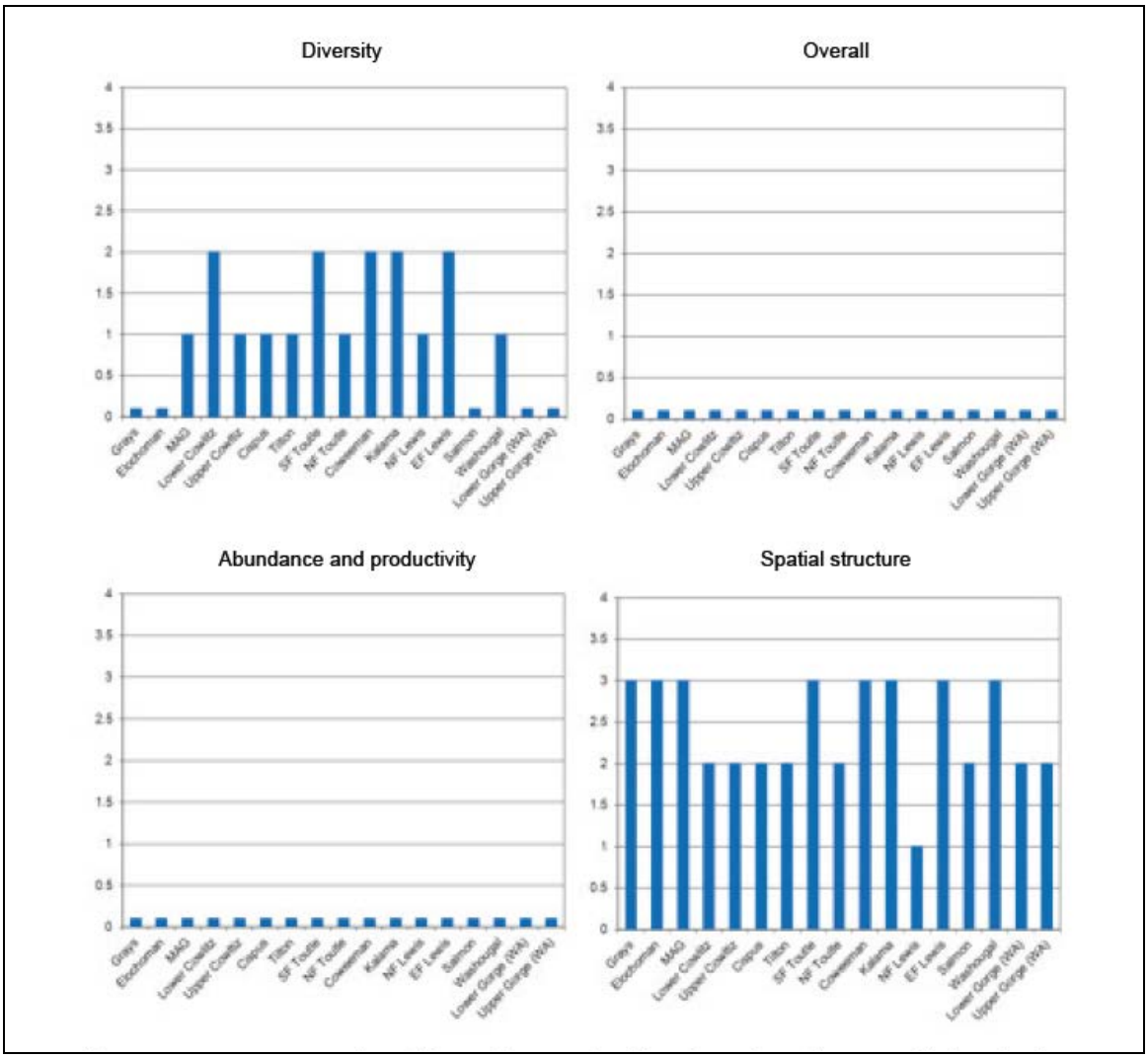

Figure 2.3: Current status of Washington LCR coho populations for the VSP parameters and overall population risk. (LCFRB 2010 recovery plan, chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Columbia River chum salmon (*Oncorhynchus keta*). ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, as well as artificial propagation programs at Big Creek, Grays River, Lewis River, and Washougal River/Duncan Creek chum hatchery programs.

Status: A report on the population structure of lower Columbia River salmon and steelhead populations was published by the WLC-TRT in 2006 (Myers et al. 2006). The chum population designations in that report are used in this status update and were used for status evaluations in recent recovery plans by ODFW and LCFRB.

The LCFRB completed a revision recovery plan in 2010 that includes Washington populations of Columbia River chum salmon. This plan includes an assessment of the current status of Columbia River chum populations, which relied and built on the viability criteria developed by the WLC-TRT (McElhany et al. 2006) and an earlier evaluation of Oregon WLC populations (McElhany et al. 2007). This evaluation assessed the status of populations with regard to the VSP parameters of A/P, spatial structure, and diversity (McElhany et al. 2000). The result of this analysis is shown in **Figure 2.4**. The analysis indicates that all of the Washington populations with two exceptions are

in the overall very high risk category (also described as extirpated or nearly so). The Grays River population was considered to be at moderate risk and the Lower Gorge population to be at low risk. The very high risk status assigned to the majority of Washington populations (and all the Oregon populations) reflects the very low abundance observed in these populations (e.g., <10 fish/year) (Ford 2011).

Table 2.2.4: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River chum populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [C,G]	Primary	VH	M	H	M[1]	VH	0%[4]	10,000	1,600	1,600
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	>500%	16,000	<200	1,300
Mill/Ab/Germ	Primary	VL	H	L	VL	H	>500%	7,000	<100	1,300
Youngs (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Cascade										
Cowlitz (Fall) [C]	Contributing	VL	H	L	VL	M	>500%	195,000	<300	900
Cowlitz (Summer) [C]	Contributing	VL	L	L	VL	M	>500%	n/a	n/a	900
Kalama	Contributing	VL	H	L	VL	M	>500%	20,000	<100	900
Lewis [C]	Primary	VL	H	L	VL	H	>500%	125,000	<100	1,300
Salmon	Stabilizing	VL	L	L	VL	VL	0%	n/a	<100	--
Washougal	Primary	VL	H	L	VL[2]	H+	>500%	18,000	<100	1,300
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L. Gorge (WA/OR) [C,G]	Primary	VH	H	VH	H[1]	VH	0%[4]	6,000	2,000	2,000
U. Gorge (WA/OR)	Contributing	VL	L	L	VL	M	>500%	11,000	<50	900

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[5] Increase relative to interim Plan.
[6] Reduction relative to interim Plan.
[7] Addressed in Oregon Management Unit plan.
[8] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

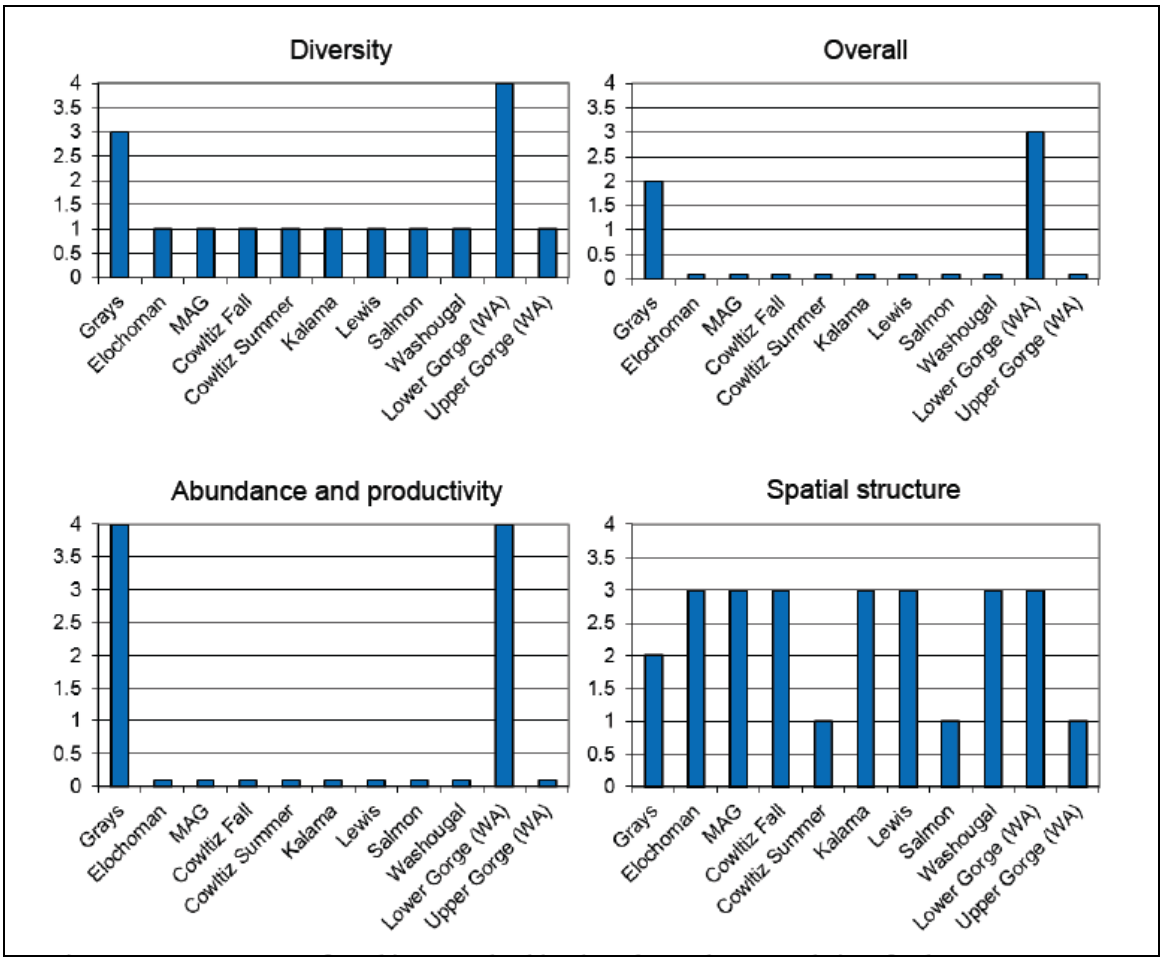

Figure 2.4: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

Lewis River eulachon (*Thaleichthys pacificus):* The Southern Distinct Population Segment (DPS) of Pacific eulachon was listed as *Threatened* under the ESA on May 17, 2010 (75 FR 13012).

Status: The lower Columbia River and its tributaries support the largest known spawning run of eulachon. The main stem of the lower Columbia River provides spawning and incubation sites, and major tributaries in Washington State that have supported runs in the past include the Grays, Elochoman, Cowlitz, Kalama and Lewis Rivers. Although generally not considered as large a eulachon run as the Cowlitz River, the Lewis River has produced very large runs periodically and nearly half of the total commercial eulachon catch for the Columbia River Basin in 2002 and 2003 came from the Lewis River. Larval eulachon have been caught in the Lewis River during sampling efforts by WDFW and the Cowlitz Indian Tribe (JCRMS 2009, NMFS 2011). During spawning, eulachon typically move upstream in the Lewis River about 10 miles to Eagle Island, but they have been observed as far upstream as Merwin Dam RM 19.5 mi. Larval eulachon have also been caught in the East Fork of the Lewis River, up to the confluence with Mason Creek, RM 5.7 mi. Merwin Dam was completed in 1931, and it presents a passage barrier to all anadromous fish, including eulachon (LCFRB 2004). The current abundance of eulachon is low and is declining in all surveyed populations throughout the DPS. The major threats and continued causes for declines in eulachon populations include climate change and its impacts on both ocean

conditions and freshwater habitat, by-catch in commercial fisheries, dams and water diversions, degraded water quality, dredging and predation (NMFS 2011).

Table 2.2.5: Baseline viability status, viability and abundance objectives, and productivity improvement targets for lower Columbia River chum populations.

		Baseline viability					Prod.	Abundance		
Population	Contribution	A&P	S	D	Net	Obj.	target	Historical	Baseline	Target
Coast										
Grays/Chinook [C,G]	Primary	VH	M	H	M[1]	VH	0%[4]	10,000	1,600	1,600
Eloch/Skam [C]	Primary	VL	H	L	VL[2]	H	>500%	16,000	<200	1,300
Mill/Ab/Germ	Primary	VL	H	L	VL	H	>500%	7,000	<100	1,300
Youngs (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Big Creek (OR) [C]	Stabilizing[2]	--[3]	--[3]	--[3]	VL	VL	--[3]	--[3]	--[3]	--[3]
Clatskanie (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Scappoose (OR)	Primary[1]	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Cascade										
Cowlitz (Fall) [C]	Contributing	VL	H	L	VL	M	>500%	195,000	<300	900
Cowlitz (Summer) [C]	Contributing	VL	L	L	VL	M	>500%	n/a	n/a	900
Kalama	Contributing	VL	H	L	VL	M	>500%	20,000	<100	900
Lewis [C]	Primary	VL	H	L	VL	H	>500%	125,000	<100	1,300
Salmon	Stabilizing	VL	L	L	VL	VL	0%	n/a	<100	--
Washougal	Primary	VL	H	L	VL[2]	H+	>500%	18,000	<100	1,300
Clackamas (OR) [C]	Contributing	--[3]	--[3]	--[3]	VL	M	--[3]	--[3]	--[3]	--[3]
Sandy (OR)	Primary	--[3]	--[3]	--[3]	VL	H	--[3]	--[3]	--[3]	--[3]
Gorge										
L. Gorge (WA/OR) [C,G]	Primary	VH	H	VH	H[1]	VH	0%[4]	6,000	2,000	2,000
U. Gorge (WA/OR)	Contributing	VL	L	L	VL	M	>500%	11,000	<50	900

Source: LCRFB 2010.
L = Low; M = Moderate; H = High; VH/E = Very High/Extinct.
[9] Increase relative to interim Plan.
[10] Reduction relative to interim Plan.
[11] Addressed in Oregon Management Unit plan.
[12] Improvement increments are based on abundance and productivity; however, this population will require improvement in spatial structure or diversity to meet recovery objectives.
[C] Designated as a historical core population by the TRT.
[G] Designated as a historical legacy population by the TRT.

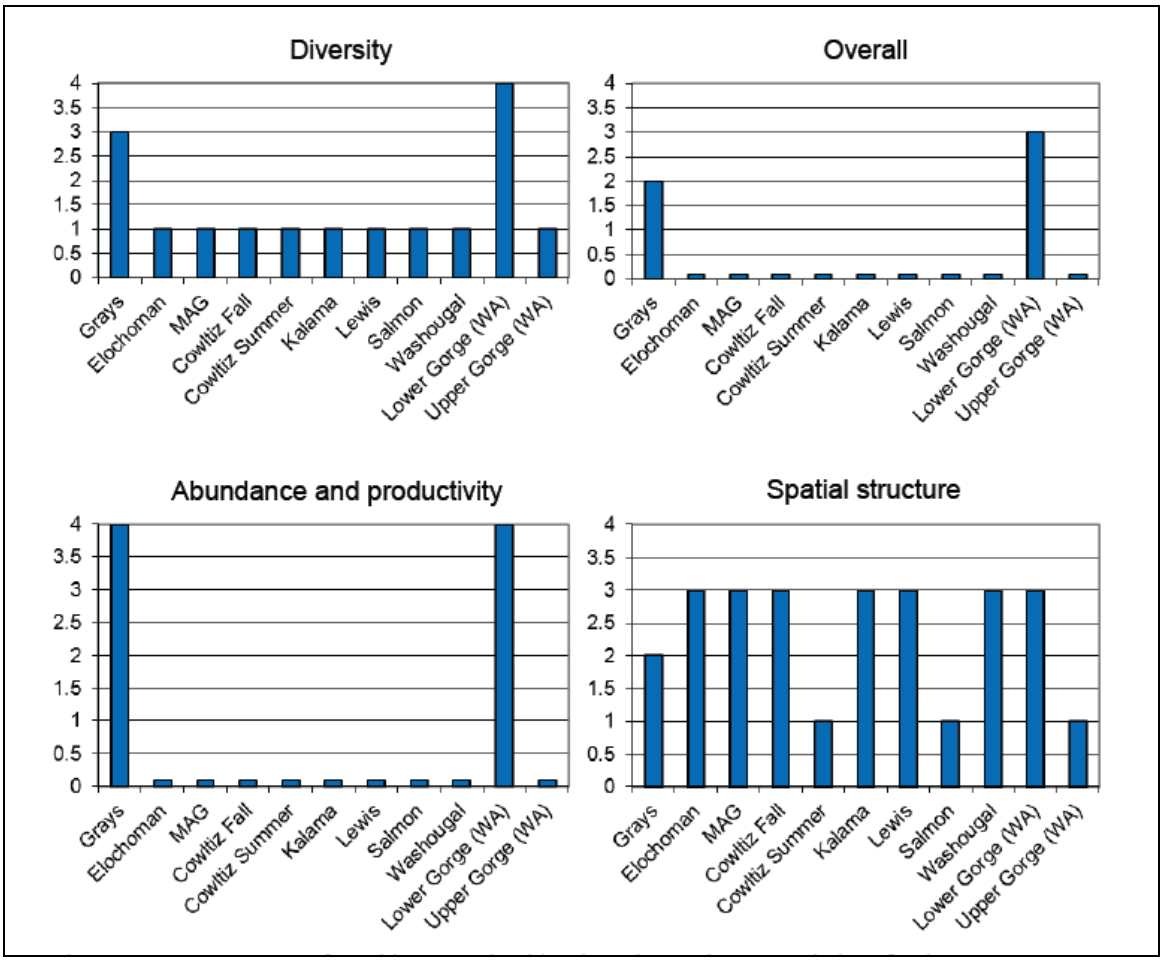

Figure 2.5: Current status of Washington CR chum populations for the VSP parameters and overall population risk. (LCFRB 2010 Recovery Plan, Chapter 6). A population score of zero indicates a population extirpated or nearly so, a score of 1 is high risk, 2 is moderate risk, 3 is low risk ("viable") and 4 is very low risk (Ford 2011).

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population.

Not available for most species. See HGMP section 11.1 for planned M&E. Juvenile coho production estimates is the one measure of production in the Lower Columbia system.

Table 2.2.6: Lower Columbia River Washington tributary coho smolt production estimates, 1997-2009 (WDFW, Region 5).

Year	Cedar Creek	Mill Creek	Abernathy Creek	Germany Creek	Cowlitz Falls Dam	Mayfield Dam
1997	-----	-----	-----	-----	3,700	700
1998	38,400	-----	-----	-----	110,000	16,700
1999	28,000	-----	-----	-----	15,100	9,700
2000	20,300	-----	-----	-----	106,900	23,500
2001	24,200	6,300	6,500	8,200	334,700	82,200
2002	35,000	8,200	5,400	4,300	166,800	11,900
2003	36,700	10,500	9,600	6,200	403,600	38,900
2004	37,000	5,700	6,400	5,100	396,200	36,100
2005	58,300	11,400	9,000	4,900	766,100	40,900
2006	46,000	6,700	4,400	2,300	370,000	33,600
2007	29,300	7,000	3,300	2,300	277,400	34,200
2008	36,340	90,97	5,077	3,976	-----	38,917
2009	61,140	62,83	3,761	2,576	-----	29,718
2010	-----	-----	-----	-----	-----	49,171
2011	-----	-----	-----	-----	-----	43,831

Source: LCR FMEP Annual Report 2010 and WDFW Data 2012.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Table 2.2.7: Spring Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2012.

Year	Cowlitz	Kalama	Lewis
2000	266	34	523
2001	347	578	754
2002	419	898	498
2003	1,953	790	745
2004	1,877	358	529
2005	405	380	122
2006	783	292	857
2007	74	2,150	264
2008	425	364	40
2009	763	34	80
2010	711	0	160
2011	1,359	26	120
2012	1,359	28	200

Source: Joe Hymer, WDFW Annual Database 2012

Table 2.2.8: Fall Chinook salmon total spawner abundance estimates in LCR tributaries, 2000-2011[a].

Year	Elochoman River	Coweeman River[a]	Grays River	Skamokawa Creek	Cowlitz River	Green River (Toutle)	SF Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River
2000	884	424	80	482	2,100	1,580	204	3,877	391	6,504	2,757
2001	230	251	104	3	1,979	1,081	102	3,451	245	4,281	1,704
2002	332	566	390	7	3,038	5,654	216	10,560	441	5,518	2,728
2003	2,204	753	149	529	2,968	2,985	327	9,272	607	11,519	2,678
2004	4,796	1,590	745	2,109	4,621	4,188	618	6,680	918	13,987	10,597
2005	6,820	1,090	387	588	10,329	13,846	140	24,782	727	18,913	3,444
2006	7,581	900	82	372	14,427	7,477	450	18,952	1,375	17,106	6,050
2007	194	140	99	36	2,724	961	30	1,521	308	10,934	2,143
2008	782	95	311	253	1,334	824	45	2,617	236	4,268	3,182
2009	231	147	93	139	2,156	1,302	66	4,356	110	6,112	2,995
2010	1,883	1,330	12	268	2,762	605	NE	3,576	314	8,908	4,529
2011	508	2,148	353	41	1,616	668	NE	10,639	334	14,033	2,961

Source: Ron Roler, WDFW Natural Spawn Progress Reports 2012.
* Estimates of total adult and jack fall Chinook. May include fish put upstream of hatchery weirs.

Table 2.2.9: Wild fall Chinook escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Grays River	Elochoman/ Skamokawa	Mill/Abernathy/ Germany
WDFW Escapement Goal	**1486**	**853**	**508**
LCSRP Abundance Target	**800**	**600**	**500**
2000	1064	650	380
2001	1130	656	458
2002	724	370	354
2003	1200	668	342
2004	1132	768	446
2005	396	376	274
2006	718	632	398
2007	724	490	376
2008	764	666	528
2009	568	222	396
2010	422	534	398
2011	318	442	270
3-year average	**436**	**399**	**355**
5-year average	**559**	**471**	**394**
10-year average	**697**	**517**	**378**

Source: WDFW Data 2012

Table 2.2.10: Wild fall Chinook escapement estimates for select SW Washington DPS populations, current WDFW escapement goals and LCSRP abundance targets.

Location	Coweeman	SF Toutle	NF Toutle/ Green	Kalama	EF Lewis	Washougal
WDFW Escapement Goal	**1064**	**1058**	**NA**	**1000**	**1243**	**520**
LCSRP Abundance Target	**500**	**600**	**600**	**600**	**500**	**350**
2000	530	490	----	921	NA	NA
2001	384	348	----	1042	377	216
2002	298	640	----	1495	292	286
2003	460	1510	----	1815	532	764
2004	722	1212	----	2400	1298	1114
2005	370	520	388	1856	246	320
2006	372	656	892	1724	458	524
2007	384	548	565	1050	448	632
2008	722	412	650	776	548	732
2009	602	498	699	1044	688	418
2010	528	274	508	961	336	232
2011	408	210	416	622	308	204
3-year average	**513**	**327**	**541**	**876**	**444**	**285**
5-year average	**529**	**388**	**568**	**891**	**466**	**444**
10-year average	**487**	**648**	***588**	**1374**	**515**	**523**

Source: WDFW Data 2012.
* 7-year average for NF Toutle/Green.

Table 2.2.11: Wild summer steelhead population estimates for LCR populations from 2001 to 2011, current WDFW escapement goals, and LCSRP abundance targets.

Location	Kalama	EF Lewis	Washougal	Wind
WDFW Escapement Goal	**1000**	**NA**	**NA**	**1557**
LCSRP Abundance Target	**500**	**500**	**500**	**1000**
2001	286	271	184	457
2002	454	440	404	680
2003	817	910	607	1096
2004	632	425	NA	861
2005	400	673	608	587
2006	387	560	636	632
2007	361	412	681	737
2008	237	365	755	614
2009	308	800	433	580
2010	370	602	787	788
2011	534	1084*	956*	1468
3-year average	**404**	**829**	**725**	**945**
5-year average	**362**	**653**	**722**	**837**
10-year average	**450**	**627**	**652**	**804**

Source: WDFW Data 2012.
* Preliminary estimates.

Table 2.2.12: Population estimates of chum salmon in the Columbia River.

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010[a]	2011[a]
Crazy Johnson Creek	---	---	966	1,471	3,639	759	1,034	981	677	2,374
WF Grays River	---	---	9,015	1,324	1,232	1,909	800	994	1,967	7,002
Mainstem Grays River	---	---	4,872	1,400	1,244	1,164	886	750	3,467	1,848
I-205 area	3,468	2,844	2,102	1,009	862	544	626	1,132	2,105	4,947
Multnomah area	1,267	1,130	665	211	313	115	28	102	427	641
St Cloud area	---	137	104	92	173	9	1	14	99	509
Horsetail area	---	---	106	40	63	17	33	6	45	183
Ives area[b]	4,466	1,942	363	263	387	145	168	141	214	162
Duncan Creek[c]	13	16	2	7	42	9	2	26	48	85
Hardy Creek	343	392	49	73	104	14	3	39	137	173
Hamilton Creek	1,000	500	222	174	246	79	114	115	247	517
Hamilton Spring Channel	794	363	346	84	236	44	109	91	187	324
Grays return[d]	12,041	16,974	15,157	4,327	6,232	3,966	2,807	2,833	6,399	11,518
I-205 to Bonneville return	11,351	7,324	3,959	1,953	2,426	976	1,084	1,666	3,509	7,541
Lower Columbia River Total	23,392	24,298	19,116	6,280	8,658	4,942	3,891	4,499	9,908	19,059

Source: Todd Hillson - WDFW Chum Program 2012

[a] Data for 2010 and 2011 is preliminary.

[b] Ives area counts are the carcass tagging estimate plus fish removed for broodstock, except for 2007 and 2008, which is area under the curve.

[c] Totals for Duncan Creek do not include broodstock brought in from mainstem spawning areas, adult trap catch or surveys below monitoring weirs only..

[d] Grays return totals include natural spawners and removed for broodstock.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Not available for most species. In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependent on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. See HGMP section 11.1 for planned M&E. The population is not currently managed for pHOS due the fact that spring Chinook have been extirpated from the upper basin. Hatchery fish are being used for reintroduction and will only be managed once reintroduction take hold in the upper basin.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock Program:

Broodstock Collection: Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. The traps are opened for Chinook collection during the entire run to (April through September) allows for collection over the entire run timing. Anadromous stocks including Chinook, coho, bull trout and steelhead (chum are not seen at the dam) are collected at Merwin Dam FCF, retained or returned back to stream. Fish are sorted on a daily basis at the Merwin Trap and 1-2 times a week at Lewis River Hatchery or dictated by numbers of fish entering the trap. All fish are identified as natural-or hatchery-origin through

examination for fin-clips or CWTs. Fish sorted at the collection facility and released may sustain some physical damage but little or no mortality is documented (see "take" tables to be submitted to NMFS).

Genetic introgression: The Lewis River Hatchery (LRH) will be operated to mimic the Lewis River natural spring Chinook population. Broodstock for this program was initiated from local Chinook salmon. The current broodstock originated from the Cowlitz, Kalama Falls, Carson NFH, Klickitat and Willamette River hatchery stocks (Marshall et al, 1995). Lewis River Hatchery spring Chinook salmon are genetically intermediate between ocean type spring Chinook from the Cowlitz and Kalama River hatcheries and stream type Klickitat Hatchery spring Chinook salmon (Marshall et al. 1995, Myers et. al 1998).Egg-takes are representative of adult arriving throughout the run and the current collection protocol preserves the range timing of the historical Chinook stock in the system.

There are no known genotypic, phenotypic, or behavioral differences between either the hatchery or natural stocks in the sub-basin. Indirect take from genetic introgression is unknown. There are no genetic introgression concerns other than broodstock mining for the integrated program, as only natural-origin fish are collected for broodstock.

Rearing Program:

Operation of Hatchery Facilities: Hatchery facility operation impacts include water withdrawal, effluent, and intake compliance. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted NPDES guidelines (see HGMP sections 4.1 and 4.2). Indirect take from this operation is unknown.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the hatchery programs. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*-Chapter 5 (IHOT 1995) have been instrumental in reducing disease outbreaks. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected with predation quickly removing those fish.

In addition, although pathogens may cause post release mortality in fish from hatcheries, there is little evidence that hatchery-origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986 and Steward and Bjornn 1990). Prior to release, the hatchery population health and condition is established by the Area Fish Health Specialist. This is commonly done one to three weeks pre-release, and up to six weeks on systems with pathogen-free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Fish are released as active smolts that will emigrate in order to minimize the effect of the release. Indirect take from density dependent effects is unknown.

Potential Lewis spring Chinook predation and competition effects on listed salmonids and eulachon: The proposed annual on-station production goal for this segregated program is: 350,000 yearlings at 12 fpp (166 mm fl) released in October/November; 500,000 yearlings at 12 fpp released in February; and 350,000 yearlings at 8 fpp (190 mm fl) released in February/March. Upper river supplementation fish are released as sub-yearlings in October at 25 fpp (130 mm fl) and yearlings in May at 10 fpp (179 mm fl). Due to size differences between hatchery smolts and sub-yearling listed stocks, competition is unlikely with different prey items and habitat preferences. In addition, the net pens are located well below the existing in-stream rearing habitat. Indirect take from predation is unknown.

Spring Chinook fry emerge between November and March, depending on time of egg deposition and water temperature, spend one full year in fresh water, and emigrate in their second spring as age-2 smolts.

Both juvenile and adult salmonids have been documented to feed on eulachon (Gustafson et al. 2010). Predation of eulachon by steelhead reared in this program may occur, however it is unknown to what degree such predation may occur.

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.

- Condition factors, standard deviation and co-efficient of variation (CV) are measured throughout the rearing cycle and at release.
- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out-of-size fish and programmed to produce smolt size fish at date of release.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.

Monitoring:
Associated monitoring Activities: WDFW has implemented an expanded monitoring program for Chinook, coho, chum and steelhead populations in the Lower Columbia River (LCR) region of Southwest Washington (WDFW's Region 5) and fishery monitoring in the lower mainstem of the Columbia River. The focus of this expanded monitoring is to 1) gather data on Viable Salmonid Population (VSP) parameters – spawner abundance, including proportion of hatchery-origin spawners (pHOS), spatial distribution, diversity, and productivity, 2) to increase the Coded Wire Tag (CWT) recovery rate from spawning grounds to meet regional standards, and 3) to evaluate the use of PIT tags to develop harvest rates for salmon and steelhead populations. Additionally, key watersheds are monitored for juvenile salmonid outmigrant abundance. Coupled with adult abundance information, these data sets allow for evaluation of freshwater productivity and development of biological reference points, such as seeding capacity. Monitoring protocols and analysis methods utilized are intended to produce unbiased estimates with measurements of precision in an effort to meet NOAA monitoring guidelines (Crawford and Rumsey 2009).

Monitoring activities are developed annually through the Annual Operating Plan (AOP).

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Table 2.2.13: Disposition of unmarked (no adipose fin-clip) spring Chinook returning to Lewis Hatchery Complex.

Brood Year	Mortality	Returned to Stream	Surplus	Spawn
2002	0	91	0	0
2003	0	236	0	0
2004	5	240	4	0
2005	0	171	0	0
2006	0	245	0	0
2007	1	150	8	0
2008	0	31	0	0
2009	0	35	0	0

2010	0	68	0	0
2011	0	81	0	0
2012	12	6	0	29
2013	4	0	0	36

Source: WDFW Hatcheries Headquarters Database 2014.

See also "Take" tables to be submitted to NMFS.

In late summer and early fall environmental conditions require staff to increase scrutiny during adult trapping operations. Options/plans for reducing pre-spawn mortality are discussed an evaluated at the pre-season meeting and broodstock needs will be adjusted according to the success of these plans.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See "take" tables to be submitted to NMFS.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

No situations are expected to occur where take would exceed ESA limits. If significant numbers of wild salmonids are observed impacted by this operation, then staff would inform the WDFW District Biologist, Fish Health Specialist or Area Habitat Biologist who, along with the Hatchery Complex Manager, would determine an appropriate plan and consult with NOAA-NMFS for adaptive management review and protocols.

Handling and release of wild coho in broodstock trapping operations is monitored and take observations have been rare. Any additionally mortality from this operation on a yearly basis would be communicated to Fish program staff for additional guidance.

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

This is a segregated/harvest program, and is not used to supplement natural-origin fish. WDFW's primary objective is to augment harvest while trying to minimize the abundance of hatchery-origin fish on the natural spawning grounds. The LCFRB Recovery Plan (2010) identifies the presence of hatchery-origin fish on the natural spawning grounds as a factor in the reduced productivity of the natural populations in Lower Columbia River ESUs.

3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. Hood Canal Summer Chum Conservation Initiative) or other regionally accepted policies (e.g. the NPPC Annual Production Review Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

WDFW uses several policies/plans that help inform management decisions regarding the HGMPs currently under review. These policies include:

1. Hatchery and Fishery Reform Policy (Commission Policy C3619)
2. The Conservation and Sustainable Fisheries Plan (draft)
3. The Hatchery Action Implementation Plans (HAIP)
4. Lower Columbia Salmon Recovery Plan (LCSRP)

Descriptions of these policies and excerpts are shown below:

Policies/Plans – Key Excerpts

Hatchery and Fishery Reform Policy: Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the Hatchery and Fishery Reform Policy C-3619 in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under *U.S. v Washington* (1974) and *U.S. v Oregon* and that hatchery reform actions must be done in close coordination with tribal co-managers. Washington Fish and Wildlife Commission Policy: POL-C3619.

Guidelines from the policy include:

1. Use the principles, standards, and recommendations of the Hatchery Scientific Review Group (HSRG) to guide the management of hatcheries operated by the Department.
2. Develop watershed-specific action plans that systematically implement hatchery reform as part of a comprehensive, integrated (All-H) strategy for meeting conservation and harvest goals at the watershed and Evolutionarily Significant Unit (ESU)/Distinct Population Segment (DPS) levels. Action Plans will include development of stock (watershed) specific population designations and application of HSRG broodstock management standards.

Conservation and Sustainable Fisheries Plan (*CSFP*)*:* The CSFP is a draft plan that has been developed to meet WDFW's responsibilities outlined in the Lower Columbia Salmon Recovery Plan (LCSRP) and address the HSRG suggested solutions and achieve HRSG standards for primary, contributing and stabilizing populations. The plan describes the implementation of changes to hatchery and harvest programs and how they assist in recovery and achieve HSRG guidelines. The draft plan also identifies Viable Salmonid Population (VSP) parameters that will be addressed.

Hatchery Action Implementation Plans (*HAIP*)*:* The HAIPs illustrate how WDFW is implementing hatchery programs to incorporate the HSRG guidelines. The plans provide the current programs and explain the future goals.

Lower Columbia Salmon Recovery Plan (*LCSRP*)*:* Some sub-basins will be free of hatchery influence and hatchery programs. In other sub-basins, hatchery programs will serve specific conservation and harvest purposes consistent with goals for naturally-spawning populations. The mosaic of programs is designed to ensure that overall each DPS will be naturally self-sustaining.

Strategies

1. Reconfigure production-based hatchery programs to minimize impacts on natural populations and complement recovery objectives.
2. Adaptively manage hatcheries to respond to future knowledge, enhance natural production, and improve operational efficiencies.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Lewis Hatchery Mitigation Agreement (*FERC Project #s 935, 2071, 2111 and 2213*). The program will operate under the Settlement Agreement (SA) for the Lewis River Hydroelectric

Projects (FERC Nos. 935, 2071, 2111 and 2213). The *Lewis River Hatchery and Supplementation Plan* (H&S Plan) was proposed by Jones and Stokes (April 2006) for the Lewis River Hydroelectric Projects (FERC Nos. 935, 2071, 2111 and 2213). Key elements for planning and goals for the system were based on the Lewis River Fish Planning Document, S.P. Cramer and Associates, April 2004. The H&S Plan is required under Section 8 of the Lewis River Hydroelectric Projects Settlement Agreement dated November 30, 2004. The goals identified by the parties to the Settlement Agreement formed the basis for actions proposed in this plan. PacifiCorp Energy and Cowlitz PUD provided the following requirements to fulfill Section 14.2.6 of the Settlement Agreement.

Future Brood Document. Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document, a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season (July 1 – June 30).

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

Total annual harvest is dependent on management response to annual abundance in Pacific Salmon Commission (PSC - U.S./Canada), Pacific Fishery Management Council (PFMC - U.S. ocean), and Columbia River Compact forums. WDFW has submitted to NOAA Fisheries a *Fisheries Management and Evaluation Plan* (FMEP) for all lower Columbia River tributaries and has updated this document after coho were listed under ESA. Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Spring Chinook are harvested in ocean commercial and recreational fisheries from Oregon to Alaska, in addition to Columbia River commercial gill net and sport fisheries. Mainstem Columbia River harvest of Lewis spring Chinook was substantially reduced after 1977, when April and May spring Chinook seasons were eliminated to protect upper Columbia and Snake wild spring Chinook. WDFW has implemented a selective fishery on the Lewis River for spring Chinook since return year 2002. This achieves the overall maximum exploitation goal for the stock (**Table 3.3.1**) and allows for maximum utilization of the hatchery program fish. Tributary harvest is managed to attain the Lewis hatchery adult broodstock escapement goal.

Table 3.3.1: Lewis River Hatchery spring Chinook fisheries contributions.

Brood Years: 2000-2009[c]			
Fishery Years: 2003-2013			
		Yearling	**DIT**
Average SAR% [a]		**0.30**	**0.25**
Agency	***Non-WA Fishery***	***% Total Survival***	
ADFG	All	*4.65*	*0.15*
CDFW	All	*0.05*	-----
CDFO	All	*5.18*	*4.81*
NFMS	All	-----	*0.03*
Agency	***Non-WA Fishery***	***% Total Survival***	
ODFW	10- Ocean Troll	*0.39*	*0.11*
ODFW	21- Columbia R. Gillnet	*1.48*	*0.61*

ODFW	40- Ocean Sport	*0.03*	-----
ODFW	44- Columbia R. Sport	*3.44*	*0.23*
ODFW	46- Freshwater Sport[d]	*0.34*	-----
ODFW	61- Test Fishery (Net)	*0.02*	-----
ODFW	72- Juvenile Sampling - Seine (Marine)	*0.11*	*0.25*
Agency	***Non-WA Fishery***	***% Total Survival***	
WDFW	10- Ocean Troll	*0.26*	*0.38*
MAKA	15- Treaty Troll	*0.16*	*0.26*
WDFW	15- Treaty Troll	*0.52*	*0.35*
WDFW	41- Ocean Sport- Charter	*0.31*	*0.12*
WDFW	42- Ocean Sport- Private	*0.23*	*0.61*
WDFW	45- Estuary Sport	*0.17*	-----
WDFW	46- Freshwater Sport[b]	*37.58*	*2.17*
FWS	50- Hatchery Escapement	*0.02*	-----
WDFW	50- Hatchery Escapement	*43.52*	*85.65*
WDFW	50- Hatchery Escapement (Strays)[e]	*0.79*	*1.72*
WDFW	54- Spawning Grounds[f]	*0.73*	*2.70*
	Total	***100.00***	***100.00***

Source: RMIS 2014

[a] Average SAR% = (tags recovered/tags released)

[b] Freshwater Sport based on WDFW Catch Record Card (CRC) data; CWT data used for DIT group.

[c] 2009 data preliminary and represents a minimum estimate.

[d] Based on harvest in the Willamette River.

[e] Includes recoveries at Cowlitz, Kalama Falls, Entiat Hatcheries.

[f] Includes recoveries in WRIA 27.

3.4 Relationship to habitat protection and recovery strategies.

The following processes have included habitat identification problems, priority fixes and evolved as key components to the *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans* (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, LCFRB 2010) and *Lower Columbia River Salmon and Steelhead ESA Recovery Plan* (Dornbusch and Sihler, June 2013).

Lewis River Hatchery and Supplementation Plan (*H&S Plan*). The development of the Hydroelectric Dams in the Lewis River system has blocked all upstream passage to 80% of the historical anadromous habitat while significant riverine habitat is permanently lost to reservoir storage. Goals as identified in the Settlement Agreement proposed by PacifiCorp Energy and Cowlitz County PUD for the Lewis River Hydroelectric Projects is to provide self-sustaining, naturally producing, harvestable native anadromous salmonids species throughout their historical range in the North Fork Lewis River FERC Nos. 935, 2071, 2111 and 2213). Options for restoring habitat and the re-introduction of fish have been detailed in the Settlement Agreement. Habitat improvements and productivity models are detailed in the Draft *Lewis River Hatchery & Supplementation Plan* and the *Lewis River Fish Planning Document, p*repared *for* PacifiCorp and Cowlitz PUD (April 2006).

Sub-Basin Planning - Regional sub-basin planning processes include the *Cowlitz River Sub-basin Salmon and Steelhead Production Plan*, September 1, 1990 with a more recent Draft Cowlitz River Sub-basin Summary (May 17, 2002) was prepared for the Northwest Power Planning Council. The Sub-basin efforts provided initial building blocks for the LCFRB regional recovery plan. The Lower Columbia fish Recovery Board (LCFRB) has adopted The Lower Columbia

Salmon Recovery and Fish and Wildlife Sub-basin Plans (Volume 1; Clark, Cowlitz, Lewis, Skamania and Wahkiakum Counties, December 15, 2004, updated June 6, 2010) with the understanding that Implementation of the schedule and actions for local jurisdictions depends upon funding and other resources.

Habitat Treatment and Protection - Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. EDT has been modeled for productivity in the Cowlitz basin in The Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans and has been used by Tacoma Power for the FERC re-licensing agreements for the upper basin productivity goals. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis (LFA) - A WRIA 26 LFA was conducted by the Washington State Conservation Commission (May 2002). WRIA 26 was separated into seven sub-basins; Coweeman, Lower Cowlitz, Toutle, Mayfield/Tilton, Riffe Lake, Cispus, and Upper Cowlitz.

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or species that could negatively impact the program:* Outmigrant hatchery fish can be preyed upon through the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays, as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons in the Columbia mainstem sloughs, can prey on steelhead smolts. Mammals that can take a heavy toll on migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas

(2) *Salmonid and non-salmonid fishes or species that could be negatively impacted by the program:* Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted through a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. In addition the program may have unknown impacts on eulachon populations in the basin.

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Multiple programs including spring Chinook, coho and steelhead programs are released from the Lewis Hatcheries and significant natural production of fall Chinook occurs, with lesser numbers of natural production of coho, chum and steelhead occurring in this system along with non-salmonid fishes (eulachon, sculpins, lampreys and sucker etc.). None of these species would be expected to have a positive impact on the program except by providing nutrient enhancement which will provide benefit to all of the natural populations.

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Spring Chinook smolts can be preyed upon release thru the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary, and thus

providing a food source for other populations. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons can prey on spring Chinook smolts. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas. Except for yearling coho and steelhead, these species may serve as prey items during the emigration through the basin. Hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. Hatchery releases can also behaviorally encourage mass emigration of multiple species through the watershed, reducing residency. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including:

a) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998);
b) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and
c) Juvenile salmonids have been observed to feed directly on carcasses (Bilby et al. 1996).

4 SECTION 4. WATER SOURCE

4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Table 4.1.1: Water sources at Lewis Hatchery Complex.

Facility	Water Source	Water Right		Available Water Flow	Avg Water Temp. (F°)[a]	Usage	Limitations
		Record/Cert. No.	Permit No.				
Lewis	Lewis R (lower intake)	S2-CV2P903/ 01084	01590	6 cfs	48-50	Adult holding/ spawning, incubation, rearing	Elevated water temperatures in the summer.
		S2-23233C WRIS	---	2 cfs			
	Lewis R (upper intake)	S2-24939C WRIS	-----	60 cfs			
Speelyai	Speelyai Creek (surface)[a]	S2-*10532CWRIS/ 07492	07941	15 cfs	48-55	Adult holding, spawning, incubation	None
	Speelyai Creek (intake)[b]	S2-*21697CWRIS/ 11380	15822	15 cfs			

Source: Phinney 2006, WDOE Water Resources Explorer 2014, WDFW hatchery data.
[a] Right held by WDFW
[b] Right held by Pacific Power & Light Co.

Lewis River Hatchery Water rights total 38,613 gpm from the Lewis River via the upstream reservoirs. All river water flow to the Lewis facility is provided via pumps. Water clarity is usually good, but can be water temperatures in the summer may be elevated. Ambient river temperatures during June through October can exceed 60°F (pers. comm. Mike Chamberlain 2014).

The Lewis River Settlement Agreement (2004) outlined repairs and upgrades needed to the intake structures at Lewis River Hatchery. Modifications to upstream intake were completed in 2012; modifications to the downstream intake are scheduled for 2015.

The water right permit for the Lewis River Hatchery is formalized through the Washington Department of Ecology (see **Table 4.1.1**), and were obtained in 1930, 1974 and 1978.

Speelyai Hatchery: Total available flow for Speelyai Hatchery is 9,200 gpm from a gravity flow intake on Speelyai Creek, tributary to Lake Merwin. All adults trapped are supplied with 100% NF Lewis River water, with adults selected for spawning purposed transported to the Speelyai Hatchery holding pond, where they are held on Speelyai Creek water. Water quality is excellent for adult holding. Maximum inflow at Speelyai is 20 cfs.

WDFW's water right (S2-*10532CWRIS) for the Speelyai Hatchery is formalized through the Washington Department of Ecology and was obtained in 1951. In addition, Pacific Power & Light Co. obtained a pump intake/right for 15 cfs on Speelyai Creek in 1969 (S2-*21697CWRIS).

Muddy River Acclimation Pond. The acclimation pond was constructed in 2012. It is located in a natural side-channel to the Muddy River; the upper end of the channel was modified provide some pass-through water from the Muddy River through an infiltration gallery. An intake structure is located on the Muddy River near the head of the side channel (Lewis River Acclimation Pond Project 2012).

Clear Creek Acclimation Pond. The pond is constructed in a natural side channel downstream from the Forest Road (FR) 9300 bridge. The intake structure pipeline extends 400-ft downstream, uses surface water from Clear Creek rather than use an infiltration gallery, and is designed to flow at around 3 to 5 cfs.

NPDES Permits:
Lewis River and Speelyai hatcheries operate under the *Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System* (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE).

Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids* (*TSS*) 1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids* (*SS*) 1 to 2 times per week on effluent and influent samples.
- *In-hatchery Water Temperature* - daily maximum and minimum readings.

Table 4.1.2: Record of NPDES permit compliance.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs (see Table 4.1.3)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Lewis WAG13-1040	Y	Y	Y	5/2/2013	0	N	Y
Speelyai WAG13-1041	Y	Y	Y	1/30/2014	1	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.

Table 4.1.3: List of NPDES violations at over the last five years (2008-2012).

Facility	Month/ Year	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
Speelyai	Oct 2010	TSS	Drawdown Max Grab	125.0 mg/L	100.0 mg/L	A combination of heavy rains and the pump not working properly.	Work order was submitted for the pump.

Source: Ann West, WDFW Hatcheries Headquarters Database 2014
Note: These violations did not result in non-compliance with NPDES permit.

Fish reared at Muddy River and Clear Creek acclimation ponds are <20,000 lbs and <5,000 lbs of fish feed per month; therefore, these programs do not require an "*Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System* (NPDES) general permit.

4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Lewis and Speelyai hatcheries. Fish rearing activities meet State water quality guidelines and satisfy all required permits.

- Program fish are confined in structures until an active smolting phase and time is achieved.
- Discharge effluents are under NPDES permit guidelines for monthly feed limits and total program production.

Acclimation ponds. Flooding could occur during the acclimation period that could allow an inadvertent release. Flooding is a natural occurrence, and is considered an acceptable "early-release" mechanism. Any fish remaining in the acclimation pond after a flood will be reared until the scheduled release time, so long as the pond conditions are stable and suitable for further rearing. Otherwise the remaining fish will be taken from the pond and placed in the river by the simplest possible means.

5 SECTION 5. FACILITIES

The Lewis River Hatchery was renovated in 2009/2011. Modifications included a redesign of the adult pond and sorting facility and three rearing ponds, and conversion of the existing large asphalt-lined ponds to a series of large concrete raceways. The new ponds are designed with supply and drain systems that tie into the modifications of the adult ponds, providing a first-pass and reuse water supply.

Figure 5.1: Aerial view of Lewis River Hatchery ponds 13-15, after remodel was completed in 2011 (source: Lewis River Hatchery staff).

Completely remodeled, Pond 13, which was a 0.5 acre asphalt pond now consists of four concrete raceways (**Figure 5.1**). Two raceways measure 190’ x 20’ x 7’ with 26, 600 cubic feet each. The other two measure 200’ x 20’ x 7’ with 28,000 cubic feet each. In-flow is provided from the upstream intake (USI) and is directed into the ponds via two sub-surface baffles behind header screens. Water exits the raceways behind a wall of outlet screens, either from an 18’’ winch-operated stand pipe over stop logs, or through a 24’’ gate-valve supplying reuse water from the Pond 14 series. Reuse/drain water from these raceways can alternately supply any or all side channels of Pond 15.

Another four concrete raceways were created in the footprint of the previous Pond 14, which was also 0.5 acre asphalt pond, immediately downstream of the Pond 13 series (**Figure 5.1**). This completely remodeled Pond 14 now consists four raceways measuring 175’ x 20’ x 7’ with 24,500 cubic feet each (**Table 5.5.1**). In-flow is also provided from the USI, and is directed into the ponds via two subsurface baffles behind header screens. All raceways in this series can be supplied with reuse from the effluent of the Pond 13 series in addition to fresh water supply. Water exits the raceways behind a wall of outlet screens, either from an 18’’ winch-operated stand pipe over stop logs, or through a 24’’ gate-valve supplying reuse water to Pond 15’s center channel. Each new “pond” was outfitted with fish-friendly release channels connecting to a 36’’ outlet line.

Figure 5.2: Lewis River Hatchery adult holding/ sorting pond (Pond 15) during construction.

Completely remodeled, Pond 15 now has four 83’ x 20’ x 6’ ponds with a volume of 8,500 cu ft. and one center (crowding channel) 170’ x 20’ x 6’ with a vol. of 18,500 cu ft. (**Figure 5.1, Figure 5.2**).

Completely remodeled, Pond 16 now consists of six concrete raceways (**Figure 5.3**). Three raceways are situated immediately above three lower raceways. The upper series measure 120’ x 20’ x 6.5’ with 15,600 cubic feet each. The lower three measure 120’ x 16’ x 6.5’ with 12,480 cubic feet each. In-flow is provided from the downstream intake (DSI) and is directed into the ponds via two subsurface baffles behind header screens. Water exits the raceways behind a wall of outlet screens, either from an 18’’ winch-operated stand pipe over stop logs, or through a 24’’ gate-valve supplying reuse water from the three upper raceways. The Pond 16 series was outfitted with fish friendly release channels connecting to a 36’’ outlet line. A high pressure pump was installed in the outlet channel of the lower series to drive four Venturi’s for pond cleaning.

Figure 5.3: Lewis River Hatchery Pond 16 after remodel (source: Lewis River Hatchery staff).

Above-ground valve access, individual float alarms, electrical outlets, lighting, walkways and handrail were also included in the remodel. The remodel the antiquated ponds has increased the rearing capacity and the quality of flow dynamics. In addition, these new changes are expected to lead to a better quality product with fewer disease problems and healthier smolts.

5.1 Broodstock collection facilities (or methods).

Table 5.1.1: Broodstock collection facilities at Lewis River Hatchery and Merwin Dam.

Ponds (number)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
1	Concrete adult/sorting pond (Center Channel) –Lewis*	18,500	170	20	6	3,800 -10,000
1	Adult /pre-sort pond - Merwin FCF	8,000	100	8	10	4,490

* See also **Table 5.3.1** for adult holding facilities.

Broodstock for this program are trapped at the Lewis River Hatchery ladder at RKm 25.3 (RM 15.7) and Merwin Dam Fish Collection Facility (FCF) at RKm 30.6 (RM 19). Traps are open for adult collection for approximately seven months to allow for collection over the entire run time. Both traps have "V" weirs to prevent the escape of captured fish.

Figure 5.4: Lewis River Hatchery spawning building showing the "pescalator" and return tubes.

Lewis River Hatchery. Adults voluntarily enter the pond via the existing ladder and into the center channel (sorting pond) to be crowded. Additionally, each of the four side ponds can be crowded into the center channel via removable bulkheads and side crowders (**Figure 5.2**). All crowding is automated by either remote or local controls. Adults can be moved via truck into two of the side ponds when sorting elsewhere is impractical. Once

crowded, the adults are side-crowded by an additional crowder into the entry of a large Archimedes Screw "pescalator" (**Figure 5.4**). From the pescalator entrance, the fish are elevated to a diverter table where they then fill one of two electro-anesthesia baskets. Each electro-anesthesia (EA) basket can be operated independently and drops the fish onto a sorting table. Fish that are selected for surplus or lethal spawning are run through a "wallaby whacker," which kills the fish instantly. A series of tubes and spiral flumes direct the fish to various destinations. Return tubes are capable of returning fish to any four of the side holding ponds. Spiral flumes send carcasses to totes for distribution. A large hoist and fry tank lower adults to be returned to stream via an underground tube exiting at the hatchery outlet.

Merwin FCF. The new upstream collection and transport facility at Merwin Dam provides safe, timely, and effective passage of adult salmonids transported upstream as part of PacifiCorp's reintroduction program. Broodstock fish are also collected at the facility and transported to one of three WDFW facilities on the Lewis River (Lewis River, Merwin, and Speelyai hatcheries). The new facility is designed to be constructed in phases, offering the ability to incrementally improve fish passage performance (if needed) in the future to meet biological performance goals. Depending on the biological monitoring of the facility's performance, there are up to four additional phases that will increase flow into the fishway attraction pools, and add a second fishway with additional attraction flow, if necessary. Phase I represents the initial construction that was completed in 2014. The operational components of the Phase I include:

- Construction of Fish Entrance 1, located in the south corner of the powerhouse;
- Nominal 400 cfs attraction flow supplied by two Auxiliary Water Supply (AWS) pumps and the fishway ladder flow;
- Construction of Fishway 1, which consist of a 4-ft entrance slot and four pools with "vertical slot" styles weirs that fish volitionally ascend to reach automatic fish crowder and loading hopper;
- Ladder water supply water which combines hatchery return water from Merwin Hatchery and reservoir water for a total of 30 cfs;
- The automatic crowder located in the upper most fish ladder pool – when the crowder is in the parked position, it works as a V-trap, and when operated crowds fish into the loading hopper;
- Construction of the fish lift and conveyance system which is designed to automatically transport fish from the fishway to the conveyance pipe and into the presort fish holding pond.
- The presort pond is approximately 100-ft x 8-ft x 10-ft, and designed to hold up to 3,700 adult coho at one time.
- Fish are removed from the presort pond into the sorting facility by false weirs and a crowder system;
- An electro-anesthesia (EA) system is provided to temporarily anesthetize the fish to allow easier handling by biologists, and to reduce stress during sorting;
- Fish are sorted and then place in one of four 3,000 gallon holding tanks or one of six 250 gallon small transport tanks;
- Fish are transferred from holding tank to the transport truck using a water-to-water transfer process.

5.2 Fish transportation equipment (description of pen, tank truck, or container used).

Table 5.2.1: Transportation equipment available at Lewis Hatchery Complex.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker truck (WDFW)	1800	Y	N	30	Sodium chloride (salt)	5000

Tanker truck (WDFW)	1100	Y	N	30	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	1800	Y	N	60	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	1800	Y	N	60	Sodium chloride (salt)	5000
Tanker truck (PacifiCorp)	250	Y	N	60	Sodium chloride (salt)	5000

Adults may be transported from the Lewis River Hatchery and the Merwin Dam FCF upstream to the Speelyai Hatchery via tanker truck; transport time is around 30 minutes.

5.3 Broodstock holding and spawning facilities.

Table 5.3.1: Adult holding/spawning facilities available.

Facility	Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Available Flow (gpm)
Lewis	4	Concrete adult /holding pond (Pond 15)	8,500	83	20	6	1000
Speelyai	1	Adult asphalt holding/ sorting pond	42,000	140	60	5	1000-1500

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available at Lewis and Speelyai hatcheries.

Facility	Type	Units (number)	Size	Flow (gpm)	Volume (cu.ft.)	Loading (eggs/unit)
Speelyai	Heath Vertical Stack Tray Units	50 units (9 tray stacks)	24" x 25' 'x 4"	3.5	n/a	4,300
	Deep trough Horizontal units	2 units (10 cells per unit)	1.25'x1.3'x1.3'	10	2.1	70,000
	Intermediate deep troughs	4	16'x2.75'x2.25'		100	

Speelyai Hatchery. Eggs are incubated on Speelyai Creek water; flow through the trays is 3.5 gpm. Water temperatures range from 48-55°F, with a DO of 10.5 ppm.

5.5 Rearing facilities.

Table 5.5.1: Rearing facilities at Lewis Hatchery Complex.

Facility	Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Density Index
Speelyai	12	Concrete raceways	2,800	80	10	3.5	400	0.3
	24	Concrete raceways	2,550	80	10	2.7	650	0.3
	4	Concrete raceways	4,500	115	10.7	37	30	0.2
Lewis River Hatchery	12	Concrete raceways	4,000	100	10	4	300	0.3
	2	Concrete raceways (Pond 13)	26,000	190	20	7	4000	0.3
	2	Concrete raceways (Pond 13)	28,000	200	20	7	4000	0.3
	4	Concrete raceways (Pond 14)	24,500	175	20	7	4000	0.3
	3	Concrete raceways (Pond 16)	15,600	120	20	6.5	2000	0.3
	3	Concrete raceways (Pond 16)	12,480	120	16	6.5	2000	0.3

Bird netting spans over the juvenile-rearing raceway series, and are supported by opposing counterweights.

Speelyai Hatchery. Chinook are ponded into the raceways. Sub-yearlings (around 120 fpp) are mass-marked in April. Rearing loadings adhere to the Piper (1982) loading levels at all times. River water is used during the entire rearing period.

Lewis River Hatchery. Sub-yearlings (90 fpp) are transferred from Speelyai Hatchery in May/June, and placed in the raceways.

5.6 Acclimation/release facilities.

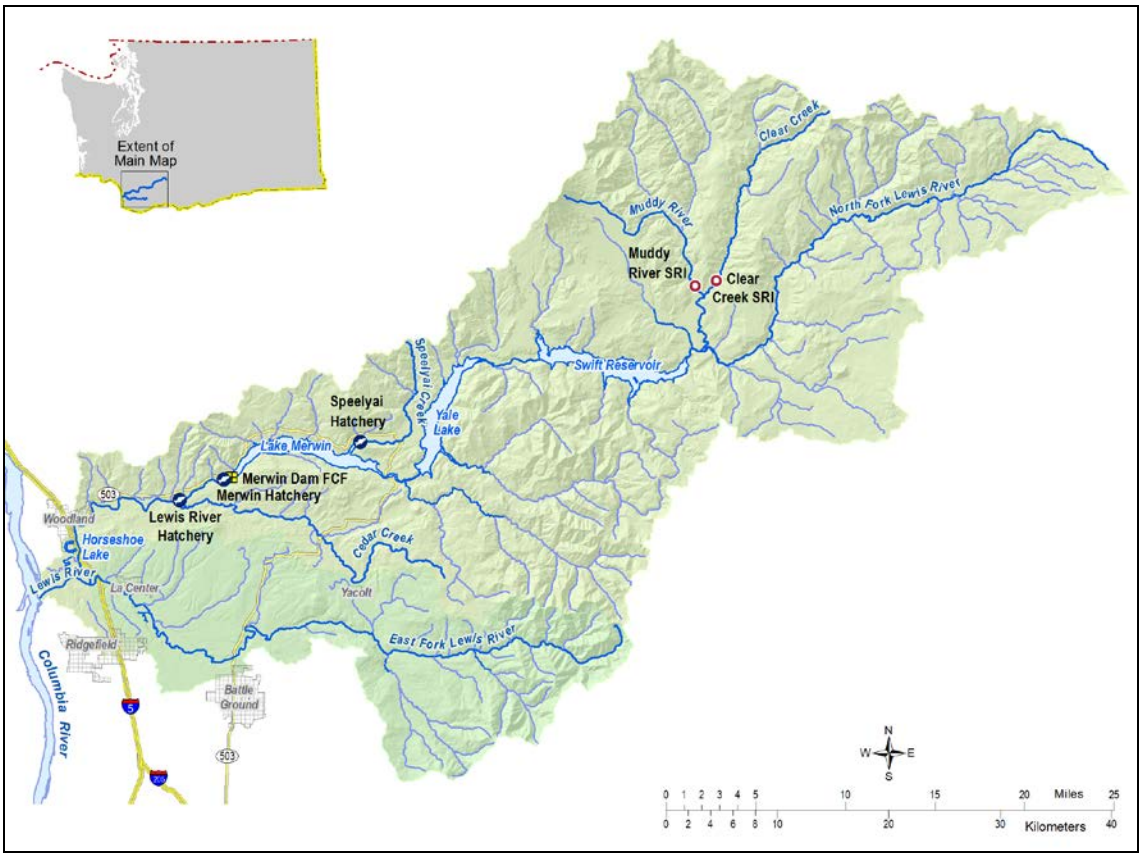

Figure 5.5: Upper Lewis River Supplementation acclimation ponds at Muddy River and Clear Creek, above Swift Reservoir.

Lewis Hatchery Complex. See HGMP section 5.5.

Muddy River Acclimation Pond (**Figure 5.6**). The pond was originally a natural side-channel, located in section of the Muddy River near the Muddy River Picnic Site, a day-use park within in the Mt St Helens National Volcano Monument, just off Forest Road (FR) 25. The natural side-channel, which is lined with trees and has boulder, gravel and large woody debris (LWD) components, has been modified on the upper end of the channel provide some pass-through water from the Muddy River through an infiltration gallery. The lower end has screened enclosure to contain the juvenile fish. Water is conveyed from the upper intake to the rearing pond via an underground flow line. The rearing area has an approximate volume of 9,500 ft^3, with the capacity to rear up to 125,400 fish. Side channel gates remain open and stored during the off-season; once access to the site is available in the early-spring (FR 25 is closed during the winter), the inlet/outlet gates will be placed and the channel watered-up and just prior to transfer of juvenile spring Chinook from Speelyai Hatchery (Acclimation Pond Project 2011).

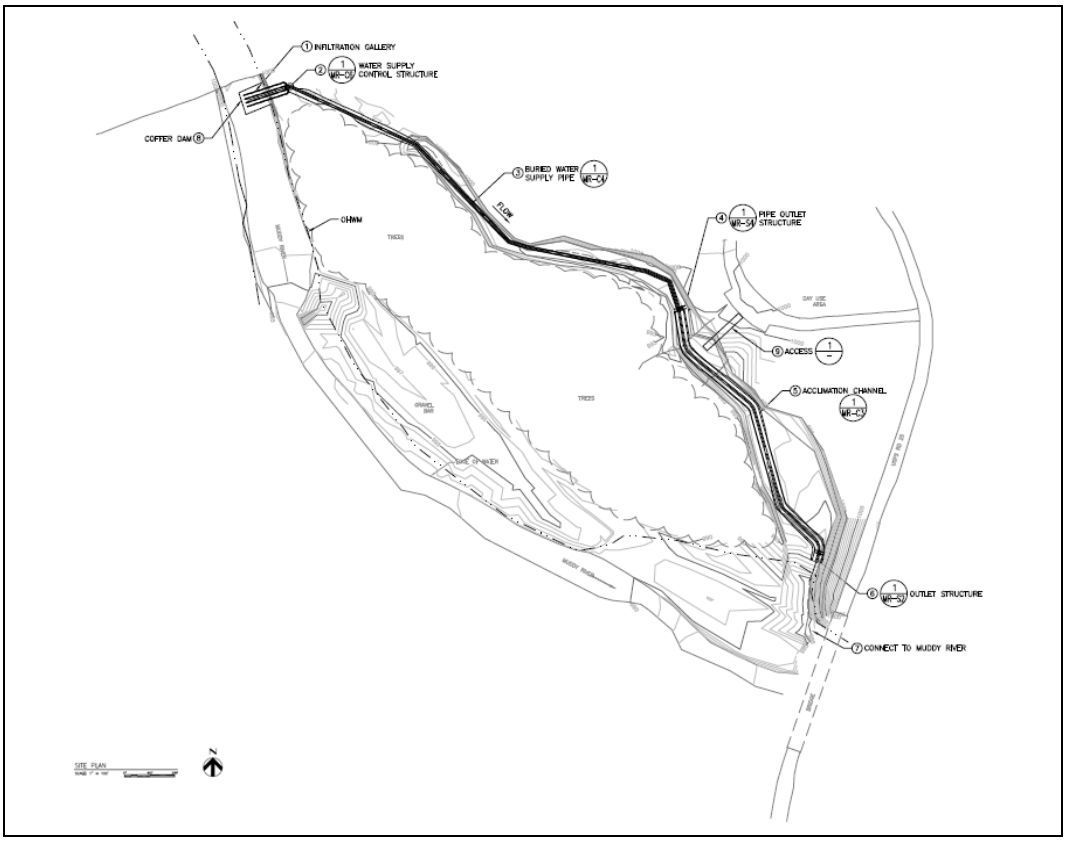

Figure 5.6: Lewis River Muddy River Acclimation Pond site plan (Acclimation Pond Projects 2011).

Clear Creek Acclimation Pond (Figure 5.7). The pond is constructed in a natural side-channel downstream from the Forest Road (FR) 93 bridge. The intake structure takes surface water from Clear Creek rather than use an infiltration gallery. The site was excavated to enhance the side-channel gradient similar to the Muddy River site, with concrete inlet and outlet structures. The Clear Creek site has an approximate volume of 6,800 ft^3, with the capacity to rear up to 89,760 fish (Acclimation Pond Project 2011).

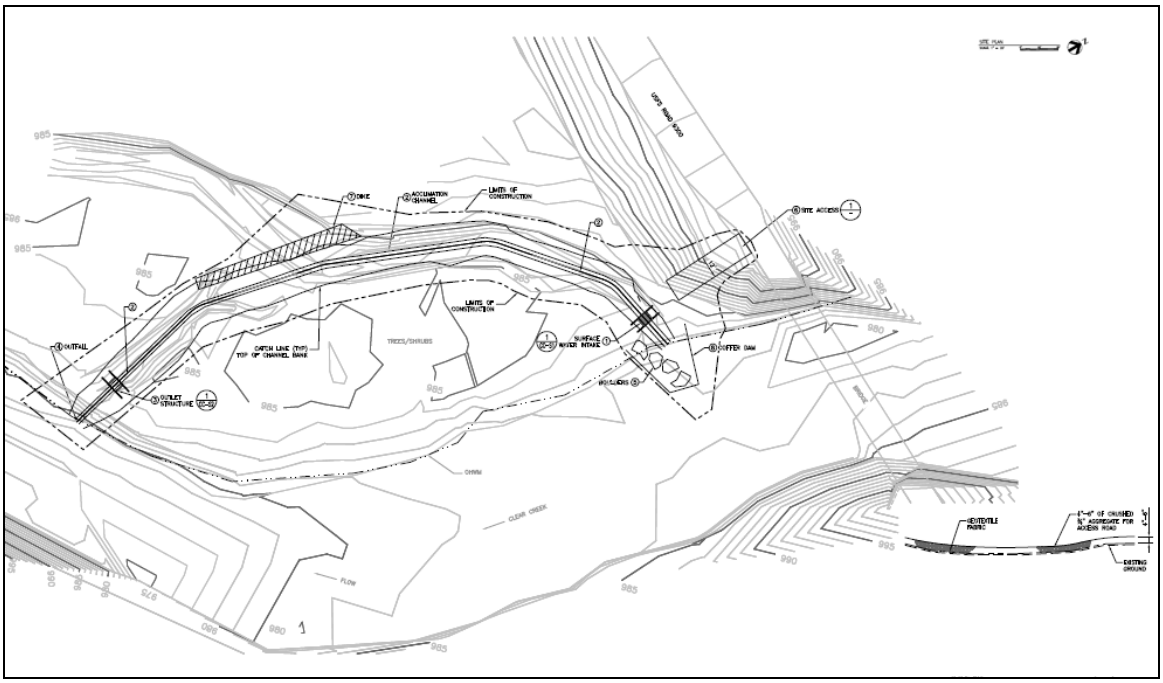

Figure 5.7: Lewis River Clear Creek Acclimation Pond site plan (Acclimation Pond Projects 2011).

5.7 Describe operational difficulties or disasters that led to significant fish mortality.

None that have resulted in significant mortality.

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Lewis Hatchery Complex. A prolonged loss of hatchery water supply would result in catastrophic loss of all rearing units, with incubation and the raceways being most vulnerable. Under a temporary cessation of the surface water supply, water can be re-directed from other supply sources as first pass or re-use to the units. Hatchery is staffed 24/7 and ready to react to system failure and WDFW has emergency procedures and plans in place. All systems are alarmed to alert us of failure.

IHOT fish health guidelines are followed. WDFW fish health specialists conduct inspections monthly and problems are managed promptly to limit mortality and reduce possible disease transmission. In the event of possible virus outbreak, WDFW facilities follow very strict disinfection procedures and comprehensive lab analysis of all egg-takes for culling, if needed.

Acclimation ponds. Flooding during the acclimation period could allow an inadvertent release. Flooding is a natural occurrence, and is considered an acceptable “early-release” mechanism. Any fish remaining in the acclimation ponds after a flood event will be reared until the scheduled release date, so long as the pond conditions are stable and suitable for further rearing. Otherwise the remaining fish will be removed from the pond by the simplest possible means and placed in the river.

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1 Source.

Broodstock used for this program are collected from fish volunteering to the Lewis Hatchery trap and Merwin Dam Fish Collection Facility (FCF) on the Lewis River. Adults used for the harvest component of this program will be hatchery-origin spring Chinook with either an adipose fin-clip (AD), AD + coded-wire tag (CWT), or unmarked (adipose present) + CWT; all are fish groups released from the harvest component of the program.

Natural-origin fish returning to the Merwin FCF, from the Upper watershed supplementation effort, will be prioritized as outlined in section 3.1.1 of the H&S Plan 2006:

1. Up to 65 adults for use as broodstock for the juvenile supplementation Program;
2. All NORs above juvenile supplementation needs for adult supplementation into the upper watershed.

6.2 Supporting information.

6.2.1 History.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Cowlitz River Spring Chinook	H	1967	1970
Carson NFH Spring Chinook	H	1960	1984
Kalama River Spring Chinook	H	Unk	Unk
Willamette River Spring Chinook (100% marked and returning adults not used)	H	1986	1986
Lewis River Spring Chinook	H	1960	Present

Attempts by this hatchery to save the indigenous Lewis River spring Chinook stock failed following the construction of Merwin Dam in the 1930s. The current broodstock originated from the Cowlitz Hatchery, Kalama Falls, Carson NFH, Klickitat Hatchery and Willamette River stocks (Marshall et al, 1995). No out of basin fish have been used for this program since 1993 (Kalama fish were used in 1993) (SHIEER, NMFS 2004). Returning adults are trapped at the Lewis Hatchery and the Merwin Dam FCF. In the Lewis River system, natural spawning occurs below Merwin Dam and in Cedar Creek. Genetically, Lewis River Hatchery spring Chinook salmon are intermediate between ocean type spring Chinook from the Cowlitz and Kalama River hatcheries and stream type Klickitat Hatchery spring Chinook salmon (Marshall et al. 1995, Myers et. al 1998).

6.2.2 Annual size.

The *Lewis River Hatchery and Supplementation Plan* (H&S 2006) set the spring Chinook broodstock target for upper river supplementation at 65 adults, with a target smolt release of 100,000. Around 690 adult pairs are needed to achieve the established egg-take goal of 1,750,000 for the segregated program (FBD 2014), based on an average fecundity of around 3,200 eggs/female and a pre-spawning mortality of 10%.

In the event that Cowlitz Salmon Hatchery is unable to meet egg-take goals for the Cathlamet Channel Net Pen program, up to 300,000 additional green eggs from Lewis River stock spring Chinook may be used as backfill. An additional 118 adults pairs would be needed to achieve this egg-take goal (see also Cathlamet Channel Net Pen Spring Chinook HGMP).

6.2.3 Past and proposed level of natural fish in broodstock.

The level of natural fish incorporated into the broodstock was unknown prior to return year 2002, when all of the program adults returning were mass-marked.

All of the adults and juveniles supplemented to the upper watershed were initially of hatchery-origin. The adult-recruits from this initial introduction were utilized for the juvenile supplementation (as broodstock) and adults for upstream supplementation. Hatchery adults were released upstream to make up any shortfall to the 2,000 adult escapement goal.

The upper river smolt supplementation was initiated with brood year 2012. This is an integrated program (see **Table 2.2.13** for total number of natural spawners used in broodstock).

6.2.4 Genetic or ecological differences.

Lewis spring Chinook are genetically similar to, but distinct from, Kalama Hatchery and Cowlitz Hatchery spring Chinook stocks and all other Columbia River spring Chinook stocks (Marshall, et al., 1995). The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks (Myers et al. 2002). The hatchery component has received more out-of-basin introductions than the Cowlitz or Kalama hatchery spring Chinook broodstock. There is no current indication that a genetic or ecologic difference exists between the hatchery and natural producing population of spring Chinook in the Lewis River.

6.2.5 Reasons for choosing.

The stock has a run-entry pattern and timing that provides harvest opportunities for fisheries in the Lewis River sub-basin, the lower Columbia mainstem/tributaries, Washington/Oregon Coast. The present naturally spawning spring Chinook population in the Lewis River is composed primarily of hatchery returns, and as a result, most naturally spawning Chinook are likely hatchery strays SaSI (draft 2002).

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

All natural-origin fish trapped in the Lewis River Hatchery and Merwin FCF adult traps will be returned directly to the river, with minimal handling and holding time. Numbers of wild fish trapped and returned to the river, and any observed mortalities will be reported in near real-time in the WDFW Hatcheries Headquarters Database.

7 SECTION 7. BROODSTOCK COLLECTION

7.1 Life-history stage to be collected (adults, eggs, or juveniles).

Adults.

7.2 Collection or sampling design.

Broodstock used for this program are collected at the Lewis River Hatchery and the Merwin Dam FCF. The traps are opened for Chinook collection during the entire run (April through September) to allow for collection over the entire run timing. Traps are supplied with Lewis River water and have “V”-weirs to prevent the escape of captured fish.

Fish are sorted on a weekly schedule as dictated by numbers of fish entering the trap; fish are transferred to Speelyai Hatchery for spawning, incubation, and early rearing. All fish are identified as natural-or hatchery-origin through examination for fin clips or CWTs, and checked for gill net or predator marks. Lengths, sex, and scales will be randomly taken from both natural-origin (adipose fin intact) and hatchery (adipose fin-clipped) fish. Scale samples and recovered

CWTs will be read at WDFW Headquarters in Olympia. Every attempt is made to represent the entire run of the broodstock.

7.3 Identity.

Spring Chinook are identified by run timing.

Segregated program. All hatchery-origin spring Chinook (except DIT-groups) have been mass-marked (adipose-fin clip) since brood year 2002. In addition, 150,000 are released AD+CWT, and150,000 are released CWT-only.

Integrated program. All yearling smolts from Muddy River and Clear Creek acclimation ponds are released CWT-only. In addition, 15,000 sub-yearlings (25 fpp) released in the upper Lewis River are PIT-tagged only.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):

See HGMP section 6.2.2.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7.4.1: Broodstock collection levels, Lewis Hatchery Complex spring Chinook.

Brood Year	Segregated				Integrated			
	Egg-Take	Females	Males	Jacks	Egg-Take	Females	Males	Jacks
2002	1,326,200	350	255	0	-----	-----	-----	-----
2003	1,638,459	423	134	0	-----	-----	-----	-----
2004	1,550,400	408	192	4	-----	-----	-----	-----
2005	1,549,900	405	246	8	-----	-----	-----	-----
2006	1,492,300	413	360	0	-----	-----	-----	-----
2007	1,713,600	437	250+185	1	-----	-----	-----	-----
2008	1,668,000	480	381+79	24	-----	-----	-----	-----
2009	1,788,000	513	341+159	9	-----	-----	-----	-----
2010	1,681,700	470	334+130	5	-----	-----	-----	-----
2011	1,578,000	436	200+222	14	-----	-----	-----	-----
2012	1,346,000	445	424	10	135,850	12	16	1
2013	2,015,740	623	484+118	9	120,000	12	23	1

Source: WDFW Hatcheries Headquarters Database 2014.
Note: "+"= live spawned.

7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Hatchery adults in excess to broodstock needs may be used for adult supplementation in the Lewis watershed above Swift Reservoir toward the annual goal of a minimum of 2000 adults (when available).

Table 7.5.1: Disposition of marked (adipose fin-clipped) spring Chinook returning to Lewis Hatchery Complex.

Brood Year	Segregated Program		
	Mortalities	Plants	Surplus
2002	41	15	1,178
2003	118	344	2,134
2004	183	204	3,411
2005	109	87	1,277

2006	85	231	2,660
2007	155	67	2,900
2008	154	19	360
2009	143	2	383
2010	269	329	461
2011	148	0	738
2012	273	0	355
2013	206	347	29

Source: WDFW Hatcheries Headquarters Database 2014.

7.6 Fish transportation and holding methods.

All fish collected at the Lewis River Hatchery and Merwin FCF traps are inoculated with erythromycin (for BKD) and then transferred to the Speelyai Hatchery for holding. During the holding period they are inoculated twice more with erythromycin. The pond is supplied with 100% first-run Speelyai Creek water. The fish receive daily one-hour standard formalin drip treatments to combat fungus problems. Yearly holding mortality is approximately 5%, which is within a targeted objective of less than 7%.

Adults are transported using two trucks from Pacificorp that have 1800 gallon tanks and two from WDFW one with an 1800 gallon tank and one with a 1,100 gallon tank attached. A normal hauling load is approximately 1,000 pounds of fish, which translates to 100 fish or less per load. These fish remain in the tank for approximately 30 minutes between the capture point and the Speelyai pond. These fish handle and haul extremely well with mortality being extremely rare. There is no application of anesthetics or salves required.

See also HGMP section 5.2.

7.7 Describe fish health maintenance and sanitation procedures applied.

Fish are inoculated twice with erythromycin during the holding period. The pond is supplied with 100% first-run Speelyai Creek water. The fish receive daily one-hour standard formalin drip treatments to combat fungus problems. The adult holding area is separated from all other hatchery operations. Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning. Spawning implements are rinsed with an iodophor solution, and spawning area and implements are disinfected with iodophor solution at the end the spawning day.

7.8 Disposition of carcasses.

Carcasses from adults that were collected and/or used for broodstock are disposed of at a landfill, due to inoculation.

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Every effort shall be made to promote local adaptation of this spring Chinook population; out-of-basin hatchery transfers of eggs or fish will only be considered in extreme cases. Proper trap operation and fish handling techniques are followed. Broodstock are collected throughout the return period. Proper and safe adult transport methods are used. Broodstock collection and sorting procedures can quickly identify non-target listed fish if encountered. Fish not used in the program are released immediately.

8 SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1 Selection method.

Spawners are selected randomly over the entire run from fish arriving at both Lewis River Hatchery and Merwin FCF traps. Broodstock numbers represent that percentage of the total run that is collected during that particular sorting period.

8.2 Males.

A ratio of 1:1 males to females is used. Jack coho salmon (2-year olds) may be incorporated into the broodstock as males at a minimum of 2%of the number of males used for spawning.

8.3 Fertilization.

A ratio of 1:1 males to females is used. Five fish pools of eggs and five fish pool for sperm are combined. Fish health procedures used for disease prevention include water hardening of all eggs in an iodophor solution for one hour. Sixty adult fish are sampled for ovarian fluid and kidney/spleen to test for viral pathogens. Agency spawning guidelines are closely followed (Seidel 1983).

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

8.5 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

- Mating cohorts are randomly selected.
- Protocols for population size, fish health disinfection and genetic guidelines followed.
- Spawn all collected mature broodstock if possible without regard to age, size, color or other physical characteristics. If not spawning all collected mature adults over the season, apply the same rationale to individual spawn days.
- Randomize mating and avoid selectivity beyond ripeness on a given spawn day.
- Use one male to one female as much as possible in order to ensure an equal genetic contribution.
- Do not mix milt from multiple males and add to eggs (pooling prior to mixing) in order to eliminate disproportionate genetic male contributions.
- Do not re-use males except as part of specific spawning protocols. A given male should be used as the first mate for only one female total.
- ELISAs are done on all females and, eggs are isolated according to ELISA values during picking. "Below-low" ELISA designations are retained for production. Various combinations of spring Chinook with low-, moderate- and high-ELISA values are either culled or transferred to the upper Cowlitz for sub-yearling plants.

9 SECTION 9. INCUBATION AND REARING -Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1 Incubation:

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

Table 9.1.1: Survival rates (%) from egg-take to ponding, Lewis River spring Chinook.

Brood Year	% Egg Survival	
	Green-to-Eyed	Eyed Egg-to-Ponding
2002	95.7	98.0
2003	93.3	98.0
2004	95.0	98.0
2005	93.0	98.0
2006	95.0	98.0
2007	93.0	95.0
2008	90.2	94.6
2009	95.5	97.0
2010	96.7	97.6
2011	95.9	97.5
2012	95.8	98.0
2013	94.3	98.0

Source: WDFW Hatcheries Headquarters Database.
NA – Not available

9.1.2 Cause for, and disposition of surplus egg takes.

The annual broodstock/egg-take collection is managed to prevent surpluses. At times, shortfalls in egg-take occur at other Lower Columbia hatcheries, and surplus eggs may be transferred to help these facilities meet their egg-take/program objectives. Otherwise, in the event that egg survival is higher than expected, WDFW Regional Managers will be contacted for instructions for disposition of the surplus in accordance with Regional policy and guidelines set forth in management plans/agreements and ESA permits.

9.1.3 Loading densities applied during incubation.

Heath stack incubators are used for this stock. Incubation conditions are consistent with loading densities recommended by Piper et al. (1982).

9.1.4 Incubation conditions.

Table 9.1.2: Minimum and maximum temperature ranges (°F) during incubation, Speelyai Creek.

Month	Temperature Range (°F)
October	48-51
November	47-49
December	44-46
January	44-45
February	45-47

Source: WDFW Hatchery Data 2014

Speelyai Hatchery. Water is supplied by Speelyai Creek, with water temperatures around 40°F, stack flows set to 3.6 gpm. Fungus growth on dead eggs in the incubators is controlled by

formalin drip treatments at a target dose of 1:600-ppm formalin throughout incubation to just prior to hatching. All eggs are water-hardened in a 100-ppm iodophor solution for 1 hour. Once eyed, eggs are shocked and dead eggs removed. Avg. 10.5

Harmful silt and sediment is cleaned from incubation systems regularly, while eggs are monitored to determine fertilization and mortality. Water temperature is monitored by thermograph and recorded and temperature units (TU) are tracked for embryonic development. Dissolved oxygen content is monitored and have been at acceptable levels of saturation (minimum criteria of 8 ppm). When using artificial substrate, Vexar® or bio-rings, egg densities within incubation units are reduced by 10%.

9.1.5 Ponding.

Speelyai Hatchery. Fry are typically ponded when the yolk slit is closed to approximately 1-mm wide (approximately 1200 TUs) or KD factor (95% yolk absorption). At this time fry are transferred to the appropriate starter raceway (See HGMP Section 5.5 for raceway specifications). Ponding takes place in December through early January.

9.1.6 Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eye, fry fingerling and sub-yearling stages. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW fish health specialist. In addition, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission. Disease treatment varies with the pathogen encountered but generally is antibiotic in nature for bacterial infections and bath or drip treatments with chemotheraputants for external infections and parasites.

See also **Attachment 1** for health monitoring information.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

- IHOT and WDFW fish health guidelines followed.
- Multiple units are used in incubators.
- Splash curtains can isolate incubators.
- Temperature, dissolved oxygen, and flow are monitored.
- Dead eggs are discarded in a manner that prevents disease transmission.

9.2 Rearing:

9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.

Table 9.2.1: Survival rates (%) from ponding to release, Lewis Hatchery Complex spring Chinook.

Brood Year	% Survival	
	Fry-to-Sub-yearling	Sub-yearling-to-Smolt
2001	95.5	95.6
2002	96.8	96.9
2003	87.0	96.6
2004	95.0	96.0
2005	95.7	97.3

2006	95.5	95.8
2007	96.6	97.9
2008	92.7	90.8
2009	99.8	96.5
2010	98.5	92.8
2011	96.2	97.8
2012	94.6	87.4

Source: WDFW Hatchery Data 2014.
NA – Not available

9.2.2 Density and loading criteria (goals and actual levels).

Lewis Hatchery Complex. Loading and density levels at WDFW hatcheries conform to standards and guidelines set forth in *Fish Hatchery Management* (Piper et. al. 1982), the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density.

9.2.3 Fish rearing conditions

Table 9.2.2: Minimum and maximum temperature ranges (°F) during rearing, Lewis River Hatchery.

Month	Max-Min Water Temps (°F)
March	40-46
April	42-48
May	44-52
June	49-56
July	52-58
August	53-59
September	55-59
October	56-60
November	50-57
December	45-51
January	41-44
February	41-42

Source: WDFW Hatchery Data 2014.

Fish are reared on a combination of river water. Temperature, dissolved oxygen and pond turnover rate are monitored. IHOT standards are followed for water quality, alarm systems, predator control measures (netting), loading and density. Settleable solids, unused feed and feces are removed regularly to ensure proper cleanliness of rearing containers. Bird netting spans over the juvenile-rearing raceway series, and are supported by opposing counterweights.

Fish are mass-marked as sub-yearlings (around 120 fpp) in early-April.

9.2.4 Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Table 9.2.3: Monthly fish growth information by length (mm), weight (fpp), condition factor and growth rate, collected during rearing at Lewis River Hatchery.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
April	84.4	89.0	N/A	N/A
May	N/A	54.6	N/A	0.364
June	102.8	44.1	1.035	0.192
July	N/A	37.1	N/A	0.159
August	N/A	32.4	1.130	0.127
September	116.4	22.6	N/A	0.303
October	N/A	17.4	N/A	0.230
November	N/A	14.0	1.189	0.195
December	150.3	12.1	Na	0.136
January	N/A	10.4	1.206	0.141
February	184.0	8.61	1.188	0.172
March	N/A	7.70	N/A	0.106

Source: WDFW Hatchery Data 2014.

9.2.5 Indicate monthly fish growth rate and energy reserve data (average program performance), if available.

See HGMP section 9.2.4.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Fish are given variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contacts. Feeding frequencies varies depending on the fish size and water temperature, and usually begin at 4-8 feedings/7 days a week, and end at 1 feeding/4 days a week. Feed rates vary from 0.5% to 2.5% B.W./day. The overall season feed conversion ratio has averaged approximately 1:1.

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

Monitoring. Policy guidance includes: *Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995). A fish health specialist inspects fish monthly and checks both healthy and presence of symptomatic fish. Based on pathological or visual signs by the crew, age of fish and the history of the facility, the pathologist determines the appropriate tests. External signs such as lesions, discolorations, and fungal growths will lead to internal examinations of skin, gills and organs. Blood is checked for signs of anemia or other pathogens. Additional tests for virus or parasites are done if warranted (see **Attachment 1** for Virology Sampling reports).

Disease Treatment. As needed, appropriate therapeutic treatment will be prescribed to control and prevent further outbreaks. Bacterial Cold Water Disease (BCWD) has been problematic at Lewis River Hatchery in early phases of rearing and is treated with Florincol and amoxicillin. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file. *Saprolegniasis* occurrences in young hatchery fish have been observed at an increasing frequency

on Mitchell Act stations. In some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor observations or occurrences of this possibility. Mortality is collected and disposed of at a landfill. Fish health and or treatment reports are kept on file.

Sanitation. All eggs brought to Lewis River Hatchery are surface-disinfected with iodophor (as per disease policy). All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots. Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water. Tank trucks are disinfected between the hauling of adult and juvenile fish. Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens (see **Attachment 1** for Virology Sampling reports).

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

Fish from this program are released on a volitional basis over a six week period, with approximately 80% of the stock volitionally migrating during that time period. The remaining 20% are forced out prior to March 20 and November 20 for the earlier fall release.

No smolt index is assessed other than the pre-stated data. Fish size at release time is critical to the readiness for migration. The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, a leaner (0.95 – 1.05) condition factor (K), a silvery physical appearance and loose scales during feeding events are signs of smolt development.

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

Not applicable.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

See HGMP sections 5.8, 6.3, 7.9 and 9.1.7.

10 SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1 Proposed fish release levels.

Table 10.1.1: **Proposed release levels (maximum number), Lewis River spring Chinook.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Sub-yearlings	15,000	25.0	October	Upper Lewis River (Crab Creek)
Yearlings	475 ,000	12.0	February/March	Lewis River
	375 ,000	12.0	October	Lewis River
	375,000	8.0	February/March	Lewis River
	50,000	10.0	April/May	Muddy River
	35,000	10.0	April/May	Clear Creek

Source: WDFW Future Brood Document 2014
Note: 25 fpp = 129 mm fork length (fl); 12 fpp = 165 mm fl; 10 fpp = 176 mm fl; 8 fpp = 190 mm fl

10.2 Specific location(s) of proposed release(s).

Table 10.2.1: Proposed annual fish release levels (maximum number) by life stage and location.

Age Class	Location			
	Stream	Release Point (RKm)	Major Watershed	Basin
Sub-yearlings	Lewis River (WRIA 27.0168)	114.3	Lewis	Lower Columbia
Yearlings	Lewis River (WRIA 27.0168)	20.9		
	Muddy River (WRIA 27.0517)	8.0		
	Clear Creek (WRIA 27.0519)	2.4		

10.3 Actual numbers and sizes of fish released by age class through the program.

Table 10.3.1: Number of fish released, size, CVs and release date, by age and year, Lewis River Hatchery spring Chinook (segregated).

Release Year	Yearlings			
	Number	Avg Size (fpp)	CV	Date
2002	864,905	8.4	13.29	Mar 20
2003	856,856	8.6	13.14	Mar 6-13, 21
2004	926,669	7.5	11.57	Feb 15-17
2005	782,854	7.5	12.15	Mar 1, 14
	97,600	11.4	16.52	Feb 15
2006	955,367	9.0	15.81	Mar 20-21
2007	945,195	8.0	15.27	Mar 19
2008	915,191	8.0	11.67	Mar 17
2009	448,527	14.0	14.03	Feb 17-Mar 16
	505,149	9.0	11.87	Mar 23
2010	961,435	7.7	n/a	Feb 19-Mar 1, Mar 3
2011	904,139	8.6	12.09	Mar 1
2012	1,256,990	7.4	9.70	Feb 1-15
2013	731,662	9.7	8.68	Feb 1-15

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 12 fpp = 165 mm fork length (fl); 8 fpp = 190 mm fl

Table 10.3.2: Number of fish released, size, CVs and release date, by age and year, Upper Lewis River spring Chinook supplementation (integrated).

Release Year	Sub-yearlings				Yearlings			
	Number	Avg Size (fpp)	CV	Date	Number	Avg Size (fpp)	CV	Date
2012	15,440	23.0	11.83	Oct 19	-----	-----	-----	-----
2013	16,200	23.2	n/a	Oct 7	82,696	12.5	n/a	Apr 1-4

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 25 fpp = 129 mm fork length (fl); 10 fpp = 176 mm fl

10.4 Actual dates of release and description of release protocols.

Segregated program releases. Volitional on-station releases occur from late-February to March 31 (see **Table 10.3.1** for release dates). Release strategies are to ensure that hatchery fish migrate from the hatchery/release site with a minimal amount of interaction with native fish populations.

Upper Lewis supplementation releases. Sub-yearling releases to the upper Lewis River occurs in October, when fish are at about 25 fpp.

Fish in the acclimation ponds will be allowed to emigrate from the ponds when at about 10 fpp, or once they begin to exhibit smolt characteristics, generally in April/May (see **Table 10.3.2** for release dates). The downstream screen will be removed and the fish are able to volitionally exit the ponds. When natural production spring Chinook smolts begin to arrive at the Swift FSC, fish remaining in the acclimation ponds will be forced out to attempt to maintain acclimation fish release timing and migration that coincides with the natural run.

10.5 Fish transportation procedures, if applicable.

Segregated program releases. Fish are reared from eyed-eggs to yearling stage at Speelyai Hatchery and sub-yearling to yearling stage at Lewis River Hatchery, and released directly into the mainstem Lewis River. Speelyai yearling smolts are trucked to the mainstem of the Lewis River and released.

Upper Lewis supplementation releases. Sub-yearling releases are transported from Speelyai Hatchery in October, and released at 25fpp. Transport time is approximately 90 minutes.

Yearlings (12 fpp) for the upper river supplementation program are transferred from Speelyai Hatchery to the Muddy River and Clear Creek acclimation ponds above Swift Reservoir in February/March of the release year. Transport time is approximately 60-75minutes.

10.6 Acclimation procedures (methods applied and length of time).

Segregated program releases. Fish are reared on river water from during their entire time at Lewis River Hatchery, and released from the ponds directly into Lewis River.

Upper Lewis supplementation releases. Sub-yearling releases are currently being released directly into Crab Creek until acclimation facilities are construction in 2015 by PacifiCorp. Yearlings (12 fpp) are transferred from Speelyai Hatchery to the Muddy River and Clear Creek acclimation ponds in February/March. Fish rear on surface water until release in May at 10 fpp.

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Table 10.7.1: Marks applied to on-station releases, Lewis River Spring Chinook.

Brood Year	Stage	Number	Mark Type
2014	**Sub-yearlings**	15,000	PIT tag-only
	Yearlings (segregated)	150,000	AD+CWT
		150,000	CWT-only
		950,000	AD-only
	Yearlings (integrated)	85,000	CWT-only

Segregated program releases. All hatchery spring Chinook, coho, winter and summer steelhead released below Merwin Dam are 100% adipose fin-clipped (AD), with the exception of the Double Index Tag (DIT) group used for fish management (H&S 2006). A total of 150,000 yearlings (50,000 each from three different releases) are released AD+CWT; and additional 150,000 (50,000 each from the three release groups) are released CWT-only. DIT groups (CWT-only) provide data on mark-selective fisheries catch contributions, run timing, total survival, migration patterns, straying, in-stream evaluations of juvenile and adult behaviors, NOR:HOR ratios on the spawning grounds.

Fish are mass-marked at Speelyai Hatchery in early-April, when fish are around 120 fpp.

Upper Lewis Supplementation yearlings are released CWT-only; this allows the fish to be distinguished to their release location.

Sub-yearlings are released with a Passive Integrated Transponder (PIT) tag.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

The program guidelines for annual broodstock/egg-take collection are managed to prevent any surpluses. In the event of unanticipated higher egg survival, WDFW Regional Managers would instruct hatchery staff for disposition of the surplus in accordance with regional policy and guidelines set forth in management plans/agreements and ESA permits.

10.9 Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the P*acific Northwest Fish Health Protection Committee* (PNFHPC) disease control guidelines, within three weeks prior to release.

Fish transfers into the sub-basin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines.

Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen-free water and little or no history of disease. Prior to this examination, whenever abnormal behavior or mortality is observed, staff also contacts the Area Fish Health Specialist. The fish specialist examines affected fish, and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and IHOT guidelines.

10.10 Emergency release procedures in response to flooding or water system failure.

Segregated program releases. There have been no instances of flooding or water system failure leading to early releases, however, policies the water systems at all of the Lewis River facilities are backed-up either by generator power or a secondary system. Lewis River Hatchery also has the ability to flush release the fish into the lower river, should it be necessary. Every attempt to keep the fish alive and healthy throughout the entire rearing-release cycle will be accommodated and all appropriate resource managers from the complex level to the federal level will be informed of the actions taken.

Acclimation ponds. Flooding during the acclimation period could allow juvenile fish to escape before their scheduled release date. WDFW recognizes that flooding is a natural occurrence, and is considered an acceptable "early-release" mechanism. Any fish remaining in the acclimation ponds after the flood even will be reared until the scheduled release date, so long as the pond conditions are stable and suitable for further rearing. Otherwise, the remaining fish will be removed from the pond by the simplest possible means, and placed in the river.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delay in the rivers, limiting interactions with naturally produced juveniles.
- Smolt releases occur in areas below known wild fish spawning and rearing habitat.
- Returning hatchery fish are under heavy selective harvest, and are identified by an adipose fin-clip.
- The DIT release group (CWT-only) provides data on mark-selective fisheries catch contributions, run timing, total survival, migration patterns, straying, in-stream evaluations of juvenile and adult behaviors, and NOR:HOR ratios on the spawning grounds.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and

adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.

- WDFW fish health and operational concerns for Lewis River Hatchery programs are communicated to WDFW Region 5 staff for any risk management or needed treatment. See also HGMP section 9.7.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1 Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

The HSRG Columbia Basin System Wide Report (2009) provides guidelines and hatchery performance standards that require monitoring both in the hatchery setting and the natural environment. Appendix A4 of the System Wide Report outlines a framework for monitoring hatchery programs that includes:

- Statement of Population Goals
- Implementation Monitoring
- Effectiveness Monitoring
- Validation Monitoring
- Regional Coordination of Monitoring and Evaluation

NOAA Fisheries has developed a guidance document on recovery monitoring that provides recommendations for monitoring, data collection, and reporting ESA information (Crawford and Rumsely 2011). This document is intended to encourage consistency in monitoring across recovery domains.

As described in Section 2.2.3, WDFW has implemented a comprehensive monitoring program in the LCR to evaluate natural-origin salmonid populations and the effects of associated hatchery programs. WDFW has incorporated HSRG and NOAA guidance into this program and has worked with PacifiCorp to integrate Lewis River monitoring programs into this regional framework.

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

The Lewis River Settlement Agreement (SA 2004) outlines monitoring requirements for the Lewis River Hatchery programs developed as part of the new license that PacifiCorp and Cowlitz PUD received from FERC. A Monitoring and Evaluation (M&E 2010) Plan, a Hatchery and Supplementation (H&S 2009) Plan and associated Annual Operating Plans (AOP) have been developed to address the monitoring requirements of the Settlement Agreement (SA 2004, H&S 2009, M&E 2010).

The M&E plan objectives are as follows:

Objective 1:	Quantify overall juvenile fish downstream survival (ODS) which includes reservoir survival, collection survival, transport survival, and survival at the release ponds
Objective 2:	Quantify SDF collection efficiency
Objective 3:	Quantify the percentage of juvenile fish available for collection that are not captured by the SDF and that enter the powerhouse intakes
Objective 4:	Quantify juvenile and adult collection survival

Objective 5:	Quantify juvenile injury and mortality rates during collection at the SDF (includes injury and mortality of adult bull trout, adult sea-run cutthroat, and steelhead kelts)
Objective 6:	Quantify the number, by species, of juvenile and adult fish collected at the SDF
Objective 7:	Quantify the number of juveniles entering Swift Reservoir
Objective 8:	Develop index of juvenile migration timing
Objective 9:	Quantify adult upstream passage survival
Objective 10:	Quantify adult trap efficiency at each upstream fish transport facility (emphasizes analysis of the Merwin Adult Trapping Facility)
Objective 11:	Quantify the number, by species, of adult fish being collected at the projects (emphasizes Merwin Dam)
Objective 12:	Quantify ocean recruits
Objective 13:	Develop performance measures for index stocks
Objective 14:	Document upstream and downstream passage facility compliance with hydraulic design criteria
Objective 15:	Determine spawn timing, distribution and abundance of transported anadromous adults
Objective 16:	Evaluate lower Lewis River wild fall Chinook and chum populations
Objective 17:	Objectives for wild winter steelhead, spring Chinook, and coho
Objective 18:	Objectives for bull trout
Objective 19:	Determine interactions between reintroduced anadromous salmonids and resident fish
Objective 20:	Document Project compliance with flow, ramping rate and flow plateau requirements
Objective 21:	Determine when reintroduction outcome goals are achieved
Objective 22:	Develop a Hatchery and Supplementation Plan (H&S) to support and protect Lewis River native anadromous fish populations and provide harvest opportunity

See HGMP section 1.10 Monitoring and Evaluation for additional plans and methods to collect data necessary.

Additional research, monitoring and evaluation in the Lower Columbia.

Monitoring activities occur in the lower Columbia River for harvest accounting and tag recovery in sport and commercial fisheries, commercial gear evaluations, natural spawn abundance estimate for fall Chinook and Chum, juvenile salmonid evaluations in trawl gear (NOAA Fisheries) and sturgeon/eulachon research and monitoring.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Monitoring activities required in the Settlement Agreement related to their license to operate the hydroelectric projects and outlined in the M&E and H&S plan (see HGMP section 11.1.1) are primarily the funding responsibility of PacifiCorp. Many of the other monitoring activities are dependent on state and/or federal funding which is not guaranteed at current levels.

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

No adverse ecological effects are expected to occur from monitoring and evaluation activities. Monitoring, evaluation and research follow scientific protocols with adaptive management processes, if needed. In addition, we will adaptively manage all other aspects of the program to continue to minimize associated risks using the more recent available scientific research.

Juvenile sampling at hatchery facilities will be conducted with accepted procedures to minimize stress and mortality from sampling. Sample sizes will be the minimum necessary to achieve statistically valid results for growth, tag retention and fish health.

Adult trapping facilities will be monitored daily, or more often as necessary to prevent injury and unnecessary delay.

VSP monitoring (including juvenile out-migrant monitoring) follows established WDFW protocols designed to minimize impacts to listed fish.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

No research is currently directly associated with the program.

12.2 Cooperating and funding agencies.

Any future research to be conducted by WDFW and funded by PacifiCorp and Cowlitz PUD would be coordinated through the following contacts.

12.3 Principle investigator or project supervisor and staff.

WDFW (Bryce Glaser) and PacifiCorp (Erik Lesko).

12.4 Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Not applicable.

12.5 Techniques: include capture methods, drugs, samples collected, tags applied.

Not applicable.

12.6 Dates or time period in which research activity occurs.

Not applicable.

12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.

Not applicable.

12.8 Expected type and effects of take and potential for injury or mortality.

Not applicable.

12.9 Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Not applicable.

12.10 Alternative methods to achieve project objectives.

Not applicable.

12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Not applicable.

12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Not applicable.

13 SECTION 13. ATTACHMENTS AND CITATIONS

Beamesderfer, R., L. Berg, M. Chilcote, J. Firman, E. Gilbert, K. Goodson, D. Jepsen, T. Jones, S. Knapp, C. Knutsen, K. Kostow, B. McIntosh, J. Nicholas, J. Rodgers, T. Stahl, and B. Taylor. 2010. Lower Columbia River conservation and recovery plan for Oregon populations of salmon and steelhead. Oregon Department of Fish and Wildlife. 423 pp. Salem, Oregon. Available from: http://www.dfw.state.or.us/fish/CRP/docs/lower-columbia/OR_LCR_Plan%20-%20Aug_6_2010_Final.pdf.

Bilby R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 53:164–173.

Dornbusch, P. and A. Sihler. 2013. ESA recovery plan for Lower Columbia River coho salmon, Lower Columbia River Chinook salmon, Columbia River chum salmon, and Lower Columbia River steelhead. National Marine Fisheries Service. Northwest Region, Portland, Oregon. 503 pp.

Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-105, 360 p.

Ford M.J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p.

Good, T.P., R.S. Waples, and P. Adams, (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department Commerce. NOAA Tech. Memo. NMFS-NWFSC-66.

H&S (Lewis River Hatchery and Supplementation Plan). 2006. (FERC Project Nos. 935, 2071, 2111, 2213) April 2006, Prepared for: PacifiCorp Energy and Cowlitz County PUD by: Jones & Stokes

H&S (Lewis River Hatchery and Supplementation Plan). 2009. (FERC Project Nos. 935, 2071, 2111, 2213) December 2009, Prepared for: PacifiCorp Energy and Cowlitz County PUD by: Jones & Stokes.

HSRG (Hatchery Scientific Review Group). 2009. Hatchery Scientific Review Group review and recommendations: Columbia Estuary – Deep River Net Pen coho population and related Hatchery Programs. Long Live the Kings. Seattle, Washington. Available from: http://hatcheryreform.us/hrp/reports/system/welcome_show.action.

IHOT (Integrated Hatchery Operations Team). 1995. Operation plans for anadromous fish Production facilities in the Columbia River basin. Volume III - Washington. Annual Report 1995. Bonneville Power Administration, Portland, OR. Project Number 92-043. 536 pp.

IHOT (Integrated Hatchery Operations Team). 1998. Hatchery evaluation report summary for Beaver Creek Hatchery: a summarized compliation of independent audits based on IHOT performance measures. Northwest Power Planning Council, Portland, OR. BPA Project Number 95-2. 25 pp.

LCFRB (Lower Columbia Fish Recovery Board). 2004. Lower Columbia salmon recovery and fish and wildlife subbasin plan, volume 1. Longview, Washington.

LCFRB (Lower Columbia Fish Recovery Board). 2010. Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan. June 6, 2010. http://www.lcfrb.gen.wa.us/Recovery%20Plans/March%202010%20review%20draft%20RP/RP%20Frontpage.htm.

M&E (PacifiCorp Energy and Cowlitz County PUD No. 1 aquatic monitoring and evaluation plan for the Lewis River). 2010. Prepared for: PacifiCorp Energy and Public Utility District No. 1 of Cowlitz County. Prepared for: PacifiCorp Energy and Public Utility District No. 1 of Cowlitz County by: ICF Bioanalysts, Meridian Environmental, Inc., R2 Resource Consultants, and Skalski Statistical Services. 74 p.

Mathisen, O.A., P.L. Parker, J.J. Goering, T.C. Kline, P.H. Poe, and R.S. Scalan. 1988. Recycling of marine elements transported into freshwater systems by anadromous salmon. Verh. Int. Ver. Limnol. 23: 2249-2258.

McElhany, P., M.H. Ruckelhaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-42.

McElhany, P., C. Busack, M. Chilcote, S. Kolmes, B. McIntosh, J. Myers, D. Rawding, A. Steel, C. Steward, D. Ward, T. Whiesel, C. Willis. 2006. Revised viability criteria for salmon and steelhead populations in the Willamette and lower Columbia basins, review draft. Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) and Oregon Department of Fish and Wildlife (ODFW). Portland, Oregon.

McElhany, P., M. Chilcote, J. Myers, R. Beamesderfer. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and lower Columbia basins, review draft. NMFS-NWFSC. Seattle, Washington.

McElhany, P., T.Bachman, C. Busack, S. Heppell, S. Kolmes, A. Maule, J. Myers, D. Rawding, D. Shively, A. Steel, C. Steward, and T. Whitesel. 2003. Interim report on viability criteria for Willamette and Lower Columbia Basin Pacific salmonids. Unpublished report. NOAA Fisheries.

NMFS (National Marine Fisheries Service). 1995. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/nmfscrit1.htm.

NMFS (National Marine Fisheries Service). 1996. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/pumpcrit1.htm.

NMFS (National Marine Fisheries Service). 1999. Endangered and threatened species: Threatened status for three Chinook salmon Evolutionarily Significant Units in Washington and Oregon, and Endangered status for one Chinook salmon ESU in Washington; final rule. Partial 6-month extension on final listing determinations for four Evolutionarily Significant Units of West Coast Chinook salmon; proposed rule. Federal Register 64:14308-14328.

NMFS (National Marine Fisheries Service). 2000a. A risk assessment procedure for evaluating harvest mortality of Pacific salmonids. National Marine Fisheries Service, Sustainable Fisheries Division, Northwest Region. May 30. 33pp.

NMFS SHIEER 2004, 70 FR 37160. June 28, 2005 - Final ESA listing determinations for 16 ESUs of West Coast salmon, and final 4(d) protective regulations for threatened salmonid ESUs; NMFS 2004. Salmonid Hatchery Inventory and Effects Evaluation Report (SHIEER). An evaluation of the effects of artificial propagation on the status and likelihood of extinction of west coast salmon and steelhead under the Federal Endangered Species Act. May 28, 2004. Technical Memorandum NMFS-NWR/SWR. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Portland, Oregon. 557p.

NMFS (National Marine Fisheries Service). 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

NPPC (Northwest Power Planning Council). 2001. Performance standards and indicators for the use of artificial production for anadromous and resident fish populations in the Pacific Northwest. Portland, Oregon. 19 pp.

Lewis River Acclimation Pond Project. 2011. (FERC Project Nos. 935, 2071, 2111, 2213) August 8, 2011, Prepared for: PacifiCorp Energy and Cowlitz County PUD McMillen, LLC. 43 pp.

Phinney, D. 2006. Compendium of Water Rights documents for Hatcheries and Wildlife areas. Washington Department of Fish and Wildlife Habitat Program. Olympia, Washington.

Piper, R., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, J.R. Leonard, A.J. Trandahl, and V. Adriance. 1982. Fish Hatchery Management. United States Dept of Interior, Fish and Wildlife Service. Washington, D.C.

Seidel, P. 1983. Spawning guidelines for Washington Department of Fish and Wildlife hatcheries. Washington Department of Fish and Wildlife. Olympia, Washington.

Sharpe, C., P. Topping, T. Pearsons, J. Dixon and H. Fuss. 2008. Predation of naturally-produced fall Chinook fry by hatchery steelhead juveniles in Western Washington Rivers. Fish Program, Science Division Washington Department of Fish and Wildlife. Olympia, Washington.

Steward, C. and T.C. Bjornn. 1990. Supplementation of salmon and steelhead stocks with hatchery fish; a synthesis of published literature. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho. Tech. Rpt. 90-1. Moscow, Idaho.

WDFW (Washington Department of Fish and Wildlife) and WWTIT (Western Washington Treaty Indian Tribes). 1998 (Updated 2006). Salmonid disease control policy of the fisheries Co-Managers of Washington State. Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes, Olympia Washington.

WDFW (Washington Department of Fish and Wildlife). 2010. Draft Conservation and Sustainable Fisheries Plan (C&SFP). Washington Department of Fish and Wildlife. Olympia, Washington. 208 pp.

WDFW (Washington Department of Fish and Wildlife). 2010. WDFW Fisheries Management and Evaluation Plan (FMEP). Lower Columbia River. Submitted to NMFS Portland, Oregon.

WDFW (Washington Department of Fish and Wildlife). 2013. 2013 Future brood document. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/publications/01356/.

WDFW (Washington Department of Fish and Wildlife). 2014. Hatcheries headquarters database. Hatcheries Data Unit, Washington Department of Fish and Wildlife. Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife). 2013. Salmonid stock inventory (SaSI). Fish Program, Science Division. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/conservation/fisheries/sasi/ .

WDFW (Washington Department of Fish and Wildlife). 2013. 2013/2014 Washington sport fishing rules. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/publications/01384/wdfw01384.pdf.

WDOE (Washington Department of Ecology). 2014. Water Resources Explorer. Retrieved July 8, 2014, from: https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx.

Wipfli, M.S., J. Hudson, and J. Caouette. 1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Can J. Fish. Aquat. Sci. 55: 1503-1511.

Attachment 1: WDFW Virology Sampling 2006-2007 through 2012-2013: Lewis Hatchery Complex.

Source: WDFW Fish Health Lab data 2014 (John Kerwin)

Hatchery/ Collection site	Stock	Species	DateSampled	Results	Comments	LifeStage	Sample number	NUMBER OF SAMPLEs						Cell Line	ID	FROZ Date
								OF	POOL	K/S	POOL	fry/visc/other	pools			
LEWIS R	LEWIS R	COHO	11/20/06	NEV		AD	1121-5/6	50	10	50	10					
LEWIS R	LEWIS R	NCOHO	11/28/06	NEV		AD	1129-3/4	10	2	10	2					
SPEELYAI	LEWIS R	COHO	12/04/06	NEV		AD	1205-3/4	12	3	25	6					
SPEELYAI	LK MERWIN	KOK	10/04/06	**IHNV**	12+/12p OF & K/S	AD	1005-1	60	12	60	12			SN	E/C	10/17/06
SPEELYAI	LEWIS R	NCOHO	12/11/06	NEV		AD	1212-1/2	7	2	14	4					
SPEELYAI	LEWIS R	NCOHO	12/18/06	NEV		AD	1219-1/2	11	2	22	4					
SPEELYAI	LEWIS R/WILD	NCOHO	12/27/06	NEV		AD	1228-9	12	3							
SPEELYAI	LEWIS R	SCOHO	10/10/06	NEV		AD	1011-9/10	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/29/06	**IHNV**	7+/12p OF & K/S	AD	0830-1/2	60	12	60	12			SN	E/C	09/28/06
SPEELYAI	LEWIS R	SPCHIN	01/24/07	NEV	10^0, 10^{-1}; tails removed	JUV/06	0125-1					5	1			
LEWIS R	LEWIS R	NCOHO	11/27/07	NEV		AD	1128-11/12	60	12	60	12					
LEWIS R	LEWIS R	SPCHIN	01/02/08	NEV	diag; 10^0 - 10^{-3}	JUV/06	0103-29			3	1					
SPEELYAI	LEWIS R	SPCHIN	08/28/07	NEV		AD	0829-8/9	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/10/07	NEV		AD	1011-2/3	60	12	60	12					
SPEELYAI	LEWIS R/WILD	NCOHO	11/28/07	NEV		AD	1129-1/2	23	5	23	5					
SPEELYAI	LEWIS R/WILD	NCOHO	12/05/07	NEV		AD	1206-7/8	22	5	37	8					
SPEELYAI	LEWIS R/WILD	NCOHO	12/12/07	NEV		AD	1213-10	15	3							
SPEELYAI	LK MERWIN	KOK	10/10/07	NEV		AD	1011-4/5	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	09/02/08	**PARAMYXOVIRUS**	1+/12p K/S	AD	0904-2/3	60	12	60	12			F&P	C	10/23/08
SPEELYAI	MERWIN LK	KOK	10/06/08	**IHNV**	6+/12p OF & 1/12p K/S	AD	1007-3/4	60	12	60	12			DB	E/C	10/17/08
SPEELYAI	LEWIS R	SCOHO	10/22/08	NEV		AD	1023-5/6	60	12	60	12					
SPEELYAI	LEWIS R	NCOHO	11/25/08	NEV		AD	1126-5/6	23	5	25	9					
SPEELYAI	LEWIS R	NCOHO	12/03/08	NEV		AD	1204-1/2	25	5	15	3					
LEWIS R	LEWIS R	NCOHO	12/09/08	NEV		AD	1209-8/9	60	12	60	12					
SPEELYAI	LEWIS R/WILD	NCOHO	12/10/08	NEV		AD	1211-1	46	10							
SPEELYAI	GOLDENDALE	RBT	01/12/09	NEV	diag, 10^0-10^{-2}	JUV/07	0113-6			2	1					
SPEELYAI	GOLDENDALE	RBT	01/12/09	**IHNV**	1+/1p K/S, diag, 10^0-10^{-2}	JUV/06	0113-5			3	1			DB	E/C	01/27/09
SPEELYAI	LEWIS R	SPCHIN	08/18/09	NEV		AD	0819-2/3	52	11	52	11					
SPEELYAI	LEWIS R	SPCHIN	08/18/09	NEV		AD	0819-2/3	52	11	52	11					
SPEELYAI	LEWIS R	SPCHIN	09/09/09	NEV		AD	0911-3/4	10	2	10	2					
SPEELYAI	LEWIS R	SPCHIN	09/09/09	NEV		AD	0911-3/4	10	2	10	2					
SPEELYAI	LEWIS R	SCOHO	10/07/09	NEV		AD	1007-7/8	60	12	60	12					
SPEELYAI	LK MERWIN	KOK	10/07/09	NEV		AD	1007-9/10	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/07/09	NEV		AD	1007-7/8	60	12	60	12					
SPEELYAI	LK MERWIN	KOK	10/07/09	NEV		AD	1007-9/10	60	12	60	12					
SPEELYAI	LEWIS R	NCOHO	11/23/09	NEV		AD	1124-3/4	15	3	30	6					
SPEELYAI	LEWIS R	NCOHO	11/23/09	NEV		AD	1124-3/4	15	3	30	6					
SPEELYAI	LEWIS R	NCOHO	11/30/09	NEV		AD	1201-17/18	22	5	30	6					
SPEELYAI	LEWIS R	NCOHO	11/30/09	NEV		AD	1201-17/18	22	5	30	6					
SPEELYAI	LEWIS R	NCOHO	12/07/09	NEV		AD	1208-4	20	4							
SPEELYAI	LEWIS R	NCOHO	12/07/09	NEV		AD	1208-4	20	4							
SPEELYAI	LEWIS R	NCOHO	12/14/09	NEV		AD	1215-18	3	1							
SPEELYAI	LEWIS R	NCOHO	12/14/09	NEV		AD	1215-18	3	1							
LEWIS	LEWIS R	NCOHO	12/15/09	NEV		AD	1215-15/16	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/15/09	NEV		AD	1215-15/16	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	06/28/10	**IHNV**	2+/3p K/S	IMM AD	0629-1			12	4			PCR	E/C	07/15/10
SPEELYAI	LEWIS R	SPCHIN	08/18/10	NEV		AD	0819-2	6	2							
SPEELYAI	LEWIS R	SPCHIN	08/31/10	**IHNV**	1+/12p OF	AD	0901-3/4	60	12	60	12			PCR	E/C	09/14/10
SPEELYAI	MERWIN LK	KOK	09/28/10	NEV		AD	0929-7/8	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/12/10	NEV		AD	1012-9/10	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/07/10	NEV		AD	1208-10/11	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/23/11	NEV		AD	0824-1/2	15	3	15	3					
SPEELYAI	LEWIS R	SPCHIN	08/31/11	**IHNV**	OF: 1+/9P; K/S NEV	AD	0831-7/8	45	9	45	9			DB		9/21/11

Hatchery/ Collection site	Stock	Species	DateSampled	Results	Comments	LifeStage	Sample number	NUMBER OF SAMPLEs						Cell Line	ID	FROZ Date
								OF	POOL	K/S	POOL	fry/visc/other	pools			
SPEELYAI	LK MERWIN	KOK	10/12/11	NEV		AD	1013-1/2	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/12/11	NEV		AD	1013-3/4	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/13/11	NEV		AD	1214-5/6	60	12	60	12					
SPEELYAI	LEWIS R	SPCHIN	08/28/12	**IHNV**	1+/12P	AD	0829-1/2	60	12	60	12			E/C	DB	9/18/12
SPEELYAI	LEWIS R	KOK	10/03/12	NEV		AD	1004-3/4	60	12	60	12					
SPEELYAI	LEWIS R	SCOHO	10/24/12	NEV		AD	1025-3/4	60	12	60	12					
LEWIS	LEWIS R	NCOHO	12/03/12	NEV		AD	1204-1/2	60	12	60	12					

14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

15 ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2).

15.1 List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> *"The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."*

15.2 Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Lower Columbia Basin DPS Bull Trout *(Salvelinus confluentus*). Bull trout were listed as threatened in June 1998 (63 FR:31647-31674). Critical habitat was designated in 2005 (70 FR 56211 56311). A recovery plan was drafted in 2005 and has not been finalized. A 5-year review was finalized in 2008. In January 2010, the USFWS proposed a revision of critical habitat.

Status: The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries. The Columbia River population segment is composed of 141 subpopulations. The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. The Service identified 20 subpopulations in watersheds of nine major tributaries of the lower Columbia River (number of subpopulations in each watershed)—the Lewis River (2), Willamette River (3), White Salmon River (1), Klickitat River (1), Hood River (2), Deschutes River (3), John Day River (3), Umatilla River (2), and Walla Walla River (3).

The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. The Klickitat Core Area includes all tributaries downstream to the confluence with the Columbia River (USFWS 2002). Local populations within the Lower Columbia Recovery Unit are currently contained in Cougar, Pine, and Rush creeks (Lewis River), and in the WF Klickitat River. Additional spawning and rearing areas within the Klickitat River have not been identified. Studies in the White Salmon and Klickitat rivers should assess the potential habitat suitability and productive capacity of tributaries that could support local populations. Subsequently, factors that may limit the reintroduction potential should be identified, and corrective restoration activities or management actions should be implemented. Reestablishment of local populations within the White Salmon and Klickitat rivers may require the use of artificial propagation and would follow Federal policy and guidelines.

*Changes in the Status of the Columbia River Interim Recovery***:** The overall status of the Columbia River interim recovery unit has not changed appreciably since its listing on June 10, 1998. Populations of bull trout and their habitat in this area have been affected by a number to actions addressed under section 7 of the ESA. Most of these actions resulted in degradation of the environmental baseline of bull trout habitat, and all permitted or analyzed the potential for incidental take of bull trout. The Plum Creek Cascades HCP, Plum Creek Native Fish HCP, and Forest Practices HCP addressed portions of the Columbia River population of bull trout.

Several other listed and candidate species are found in Clark, Cowlitz and Skamania Counties; however the hatchery operations and facilities for this program do not fall within the critical habitat for any of these species. As such there are no effects anticipated for these species.

Other listed or candidate species:
"No effect" for the following species:

Northern Spotted owl (*Strix occidentalis caurina*) –Threatened (Critical Habitat Designated)
Columbia white-tailed deer (*Odocoileus virginianus leucurus*)
Grizzly bear (*Ursus arctos*)
Canada lynx (*Lynx canadensis*)
Golden paintbrush (*Castilleja levisecta*) [historic]
Water howellia (*Howellia aquatilis*)
Bradshaw's lomatium (*Lomatium bradshawii*)
Nelson's checker mallow (*Sidalcea nelsoniana*)
Marbled murrelet (*Brachyramphus marmoratus*) (Critical Habitat Designated)
Gray wolf (*Canis lupus*); although Table 6.0-1 in the Final BE stated the proposed actions "was not likely to adversely affect" the gray wolf, it was clarified by the Utilities on May 17, 2006, that the effect determination should have been a "no effect" for the gray wolf to be consisted with the statement on page 58 that "we do not anticipate any project effects on the gray wolf."

Candidate Species
(Brush Prairie) Mazama pocket gopher (*Thomomys mazama* ssp. *oregonus*)
North American wolverine (*Gulo gulo luteus*) – contiguous U.S. DPS
Oregon spotted frog (*Rana pretiosa*) [historic]
Fisher (*Martes pennanti*) – West Coast DPS
Mardon skipper (*Polites mardon*)
Whitebark pine (*Pinus albicaulis*)

15.3 Analyze effects.

Actions associated with this hatchery program that may affect the bull trout population in the North Fork Lewis River:
Anadromous Reintroduction- Overall, the anadromous fish reintroduction program will likely be beneficial by providing MDNs and increasing the forage base for bull trout. This strategy will be aided by the reintroduction schedule as laid out in the SA where salmon and steelhead are reintroduced above Swift Creek Dam 4½ years after the licenses are issued. Yale Lake reintroduction begins with the HPP calling for adults to be transported to Yale Lake 8 years after the licenses are issued. Finally Merwin Lake reintroduction begins with the HPP in year 12 of the new licenses. This strategy allows time for assessments to occur prior to massive reintroductions at each project.

15.4 Actions taken to minimize potential effects.

The *Hatchery and Supplementation Plan* (2006) will include measures to minimize the potential negative impact of hatchery fish on bull trout and other ESA-listed species (SA 8.2.2.10). Program steelhead are released fully smolted to foster rapid outmigration from the basin and to minimize predation and residualism risks.

15.5 References

Biological Opinion for the Federal Energy Regulatory Commission Relicensing of the Lewis River Hydroelectric Projects: Merwin (No. 935), Yale (No. 2071), Swift No. 1 (No. 2111), Swift No. 2 (No. 2213), FWS Reference number 1-3-06-F-0177.

LCFRB (Lower Columbia Fish Recovery Board). 2004. Lower Columbia salmon recovery and fish and wildlife subbasin plan, volume 1. Longview, Washington.

USFWS (U.S. Fish and Wildlife Service). 2002. Chapter 20, Lower Columbia Recovery Unit, Washington. 89 p. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

16 "Take" Tables

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Chinook (*Oncorhynchus tshawytscha*) Steelhead *(Oncorhynchus mykiss*) Coho (*Oncorhynchus kisutch*)	**ESU/Population:** Lower Columbia River Chinook Lower Columbia River Steelhead Lower Columbia River Coho	**Activity:** Lewis Spring Chinook Program
Location of hatchery activity: Lewis River Hatchery, Lewis River (WRIA 27.0168) at RKm 25.0 Merwin Dam Fish Collection Facility, Lewis River (WRIA 27.0168) at RKm 30.4 Speelyai Hatchery , Lewis River (WRIA 27.0168) at RKm 46.7	**Dates of activity:** August-November	**Hatchery program operator:** WDFW

Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass [a]	TBD	TBD	TBD	TBD
Collect for transport [b]	TBD	TBD	TBD	TBD
Capture, handle, and release [c]	TBD	TBD	TBD	TBD
Capture, handle, tag/mark/tissue sample, and released[d]	TBD	TBD	TBD	TBD
Removal (e.g. broodstock) [e]	TBD	TBD	TBD	TBD
Intentional lethal take [f]	TBD	TBD	TBD	TBD
Unintentional lethal take [g]	TBD	TBD	TBD	TBD
Other Take (specify) [h]	TBD	TBD	TBD	TBD

* Highest number of unmarked fall Chinook trapped and released in the Lewis River.
**Highest number of unmarked fall Chinook mortalities from trap operations in the Lewis River.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:
1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.